

Exploring the Roles of Gender and Ethnicity as Antecedents of Trust in 3D Immersive Electronic Commerce

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Abstract

The next generation Internet is expected to be a complete visual, audio experience, and possibly haptic experience. It will emulate real life experiences as virtual worlds filled with virtual objects simulating real world interact with users naturally. Users are also expected to be represented in avatars, providing a sense of self-identity and personality. While the Internet is likely to move into 3D format with Second Life leading the pack, the fate of electronic commerce in this light has largely been unexplored. Questions as to the effects and impact of such virtual electronic commerce, especially virtual 3D malls or stores in an immersive online environment on web users are still not answered. This study forms an early exploration on the effects and impact of gender and ethnicity towards the perceived usefulness, perceived ease of use, trust, and intended use of the electronic commerce on the 3D online virtual malls or stores. Its results show that these factors have a significant impact on how such online malls and stores are perceived by users in Malaysia. The implications and proposed future directions of the study are also discussed.

1. Introduction

Experts in the leading industries in the information technology world (IBM, Intel, Cisco etc.) expect the next great leap of the Internet to be 3D in nature [1-3]. The growth of Second Life has provided companies such as Toyota, Nissan, American Apparel, Adidas, and many other large companies to experiment with the setting up of such retailing ventures in immersive 3D worlds. It is not surprising therefore to find that researchers [4] have predicted that in the near future, many such electronic commerce activities would be carried out in 3D immersive online environments.

While network technologies and computing powers are being developed towards 3D Internet [1], very little studies have been undertaken to inspect how users would react to electronic commerce in the 3D environment. This study attempts to analyze the impact of gender and ethnicity towards factors (presence and para social presence) heightened by the 3D environment, and the perceived usefulness (PU), perceived ease of use (PEOU), trust (Tru) and intended use (IU) of such online 3D virtual stores.

Presence and Para Social Presence

Presence is the sense of being there [5, 6] and includes responses to spatial cues. In this study, Schubert et al.'s [7] proposed factors for presence: spatial presence (SP), (physical) involvement (PI), and experienced reality (ER) were used. The word 'physical' was added to Schubert et al's [7] original 'involvement' in this study to differentiate it from 'involvement', another factor in para social presence. Para social presence addresses the social and relationship between the users and the website and is defined as "the extent to which a medium facilitates a sense of understanding, connection, involvement, and interaction among participating social entities" [8 ,p.8]. It includes factors such as sense of understanding (SU), dominance (Dom), involvement (Inv), positivity (Pos), and Immediacy/Intimacy (II)

Gender

The gender factor was selected for this study for numerous reasons. First, studies [9] have estimated that 45% of online shoppers are female. The large percentage suggests that women's roles should not be ignored. Second, studies have also shown that men tend to perform better on spatial orientation tasks than women [10, 11], implying that women may have difficulties in a 3D virtual shopping environment compared to men.

Ethnocentric Tendencies

As Malaysia's population is made up of people of different ethnic background, mainly Malay, Chinese, Indian, and the indigenous groups, who still practice individual cultural traditions over the years. The multiracial composition provides an excellent background for a study of the ethnographic impact on their perceptions of 3D electronic commerce. Studies by Kamaruddin et al. [12] of Malaysian consumers using CETSCALE have shown that consumer ethnocentric tendencies differ significantly. For example, they found that Malays tend to demonstrate a higher level of consumer ethnographic tendencies than the Chinese.

In brief, the study will look into the impact of gender and ethnicity against para social presence and presence factors, perceived ease of use, perceived usefulness, trust, and intended use (refer Figure 1).

2. Methodology

An empirical quantitative research methodology was adopted for this study. A set of questionnaire with instruments adopted from various existing literatures

was designed. Items were adopted and refined from Schubert et al. [7] (presence factors), Kumar and Benbasat [8] (para social presence factors), Davis [13] (perceived ease of use, perceived usefulness, and intended use), and Pavlou [14] (trust) studies. The items were of Likert scale from the range of 1 (strongly disagree) to 7 (strongly agree) and were subjected to 4 judges' examination. Based on the feedback from the judges, a few items which were deemed as

repetitive were dropped. Following Bhattacharjee [15] and Kaluscha [16], a few research labs were set up with software from Active World, a 3D online website with projectors. The respondents were given a short demonstration by the facilitator on how to use the 3D electronic commerce website, and provided a scenario/task to perform in the virtual 3D mall before being asked to fill up the questionnaire.

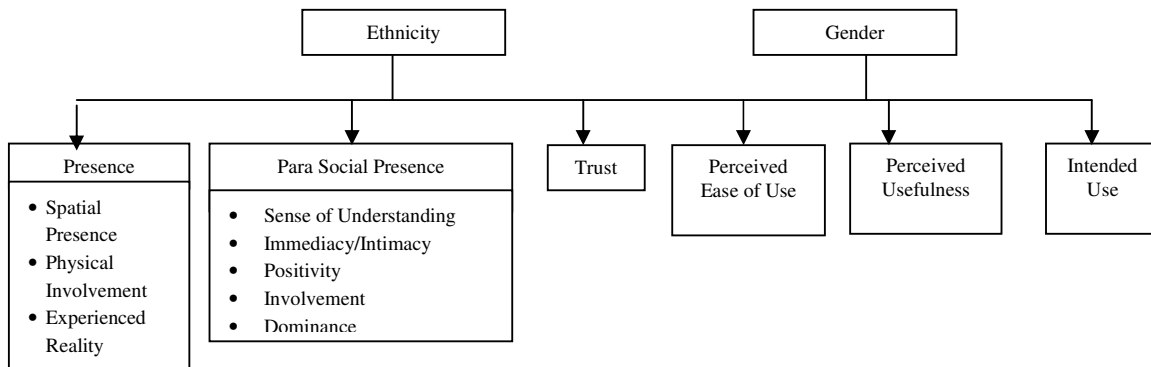


Figure 1 Model of Research Framework

Pilot Study

A pilot study of 81 respondents was conducted. The results of the pilot study underwent reliability testing with Cronbach Alpha and either met or exceeded Nunnally's [17] recommended threshold of 0.70. The data was then subjected to a factor analysis with maximum likelihood extraction method and varimax rotation. The results indicated 14 factor loadings instead of the expected 12 factors. Following Hair et al.'s [18] suggestion, items with factor loadings of less than 0.50 were removed resulting in 12 factors.

Actual Survey

A similar survey was then carried out with (N) 273 respondents comprising of first and second year information technology undergraduates. The sample size fulfilled Guildford's [19] proposed minimum of 200 respondents and Kline's [20] recommended respondents to variables ratio of 2:1 (273:50). In a lab based survey such as this, it was not possible to recruit large numbers of respondents. Information technology undergraduates were deemed suitable as they are familiar with the Internet and use of computer and are the most likely users of electronic commerce [21, 22]. The whole process including the round of activity took approximately 40 minutes.

The data collected was then analyzed with statistical methodologies using SPSS version 11. One-way ANOVA was used to determine the significant relationships between ethnicity against the other factors while independent sample t-test was used for gender against the other factors.

3. Descriptive Results

An examination of the 'feel' of the data reveals that the responses to most items were generally bell-shaped, with negative skewness at -0.72 to -0.995 and a kurtosis of -0.429 to 1.900, well within Bhattacharjee's [15] recommendation of -2 to +2. The means of the items range between 4.94 and 5.72.

Generally, the age of the respondents are between 17 to 32 years old and 79.3% of them fall within the bracket of 20-29 years old, consistent with AC Nielson Consults's survey results of 89% Malaysian Internet surfers [23] in the same age group. The same survey also reported that male Internet users form 28% while females represent 21% of the population, consistent with the research sample's gender makeup of males at 64.1% and females at 35.9%.

4. Preliminary Analysis

The collected data was again subjected to a Cronbach alpha test and met Nunnally's [17] recommended threshold of 0.70. The overall Kaiser-Meyer-Olkin (KMO) results indicate a 'very good' reading at 0.947 and suggest that it is compatible for exploratory factor analysis [24]. Again, rotated factor analysis with maximum likelihood method and Varimax rotation was applied and this time the items converged into the respective 12 factors.

A confirmatory factor analysis (CFA) was then conducted and based on the modification indices, some items were removed to improve fitness of the

data set. The final result has a better fit and resulted in only 36 items (Refer Table 1).

Table 1 Results of the Confirmatory Factor Analysis (CFA)

Fit Measures	Recommended	Source	Initial	Final
χ^2	χ^2 value at $p \geq 0.05$	[25]	0.0	0.276
$\chi^2/d.f$	≤ 3	[26, 27]	1.342	1.036
GFI	≥ 0.90 (≥ 0.80)	[26], [28]	0.83	0.903
AGFI	≥ 0.90 (≥ 0.80)	[26], [28]	0.805	0.877
NFI	≥ 0.90	[28, 29]	0.902	0.941
CFI	≥ 0.90	[29]	0.973	0.998
TLI	≥ 0.90	[30]	0.97	0.997
RMSEA	≤ 0.05	[25, 31]	0.035	0.011

The data was then subjected to convergent and discriminant validity testing. Convergent validity factor loadings in the scales either meet or exceed the minimal threshold of ≥ 0.70 [15, 18] with the range of 0.733(Pos5) to 0.963(Inv6) while the amount of variance in the items' values of scales range from 0.537 (Pos5) to 0.927 (Inv6) exceeding the minimum threshold of ≥ 0.50 recommended by Fornell and Larcker's [32]. As for discriminant validity testing, the readings of the scales for composite factor reliability range from 0.864 (Pos) to 0.955 (Inv), far exceeding the recommended threshold of ≥ 0.70 . The range of results between the factors is from 0.28 (II \leftrightarrow SU) to 0.677 (Dom

\leftrightarrow Inv), well below the maximum threshold of 0.85 suggested by Kline [27]. A comparison of the square roots of the average variances extracted from each latent construct with the correlations between factors shows that in general, the square roots of the average variances are greater than the correlations between the factors.

5. Analysis and Discussion

Effects of Gender

The effects of gender against all the factors in the model were examined by using simple t-test. The overall results are summarized in Table 2 below:

Table 2 Results of t-test for Gender Bias

Factor	t	df	Sig (2-tailed)	Significance
Intimacy/immediacy	2.786	271	0.06	Not significant
Sense of understanding	3.765	271	0.00	Significant
Positivity	1.401	271	0.162	Not significant
Involvement	3.412	271	0.001	Significant
Dominance	2.183	171.872	0.30	Not significant
Spatial Presence	3.307	271	0.01	Significant
Physical Involvement	3.333	155.128	0.01	Significant
Environment Reality	2.801	271	0.05	Not significant
Perceived Ease of Use	4.568	271	0.000	Significant
Perceived Usefulness	5.166	139.660	0.000	Significant
Trust	6.990	271	0.000	Significant
Intended Use	4.243	271	0.000	Significant

Table 3 Means of Significant Relationship for Gender Factor

Factor	Mean (M)	
	Men	Women
SU	5.58	5.18
Inv	5.60	5.18
SP	5.31	4.87
PI	5.30	4.82
PEOU	5.62	5.14
Tru	5.30	4.41
IU	5.23	4.66

Interestingly, the results seem to suggest men displayed higher para social presence factors i.e. sense of understanding and involvement from the website as compared to women. The other three factors of para social presence presence show no significant effects on both women and men (dominance $t(171.872) = 2.183$, $p = 0.30$, positivity $t(271) = 1.401$, $p = 0.162$, and immediacy/intimacy $t(271) = 2.786$, $p = 0.06$).

The results appear to contradict sociolinguistics studies [33-35] which show that in virtual communities, "men tend to establish superior social standings while women communicate with

undertone of rapport, compassion, and empathy”[36, p.78].

Men also experienced higher spatial presence ($t(271) = 3.307, p = 0.01$) and physical involvement ($t(155.1) = 3.333, p = 0.01$) for presence. The differences of the level of presence experienced by the different genders could be explained and supported by studies [37, 38] which show that men and women adopt different strategies and approaches in navigation and spatial tasks in real life.

The results show that significant differences are displayed by the different genders in their perceived usefulness ($t(271) = 5.863, p = 0.00$) and perceived ease of use ($t(271) = 4.568, p = 0.00$) of the virtual ecommerce websites. The result

generally corroborated other studies [39, Roper Center40, 41] which suggested that computer culture is generally perceived to be a socially male dominated domain.

The results also show that more men tend to trust and intend to use the virtual shopping mall compared to women. The result is also supported by previous studies [42-44] which indicate that men are more likely to use the Internet to shop or research purchases and Kehoe et al. [45] who show that generally women are more cautious when doing ecommerce shopping.

Effects of Ethnicity

A one way ANOVA was conducted to test the effects of ethnicity with all the factors involved.

Table 4 Significant Results of One-Way ANOVA for Ethnicity Bias

Factor	Ethnicity	Ethnicity	Difference	Sig.
Sense of Understanding	Malay	Chinese	0.80	0.000
		Indian	0.71	0.000
		Others	0.61	0.000
Positivity	Malay	Chinese	0.27	0.031
		Others	0.42	0.005
Involvement	Malay	Others	0.37	0.030
Dominance	Malay	Chinese	0.30	0.031
Spatial Presence	Malay	Chinese	0.56	0.000
		Others	0.45	0.13
Experienced Realism	Malay	Chinese	0.55	0.000
	Chinese	Others	-0.52	0.002
Perceived Ease of Use	Malay	Chinese	0.45	0.000
		Others	0.41	0.005
Perceived Usefulness	Malay	Chinese	0.45	0.001
Trust	Malay	Chinese	0.36	0.019

Table 5 Means of Significant Relationship for Ethnicity Factor

Factor	Mean (<i>M</i>)	
	Malay	Chinese
SU	5.91	5.11
Pos	5.41	5.15
Dom	5.67	5.36
SP	5.47	4.91
ER	5.33	4.75
PEOU	5.70	5.25
PU	5.50	5.05
Tru	5.18	4.08

Due to the large table generated by SPSS, only the significant results are summarized in Table 4.

The Malaysian Malay ethnic group displays significant bias towards para social presence factors compared to the Malaysian Chinese [with the results of the one-way ANOVA’s LSD sense of understanding (M (Malay) = 5.91, M (Chinese) = 5.11), positivity (M (Malay) = 5.41, M (Chinese) = 5.15), dominance (M (Malay) = 5.67, M (Chinese) = 5.36)].

As for presence, the results from the analysis reveals that Malays tend to display more inclination to feel spatial presence compared to the Chinese [$(M$ (Malay) = 5.47, M (Chinese) = 4.91) and environment reality (M (Malay) = 5.33, M (Chinese) = 4.78)].

Although no study on the relationship between ethnographic groups in Malaysia and para social presence factors have been found, Gould et al.’s [46] study show that Malays who express satisfaction with products are committed to the purchase, hence lending credence to the notion that the quality of the relationship and not the products matters more to Malays.

The Malay ethnic group also found the 3D virtual and immersive electronic commerce environment easy to use compared to Chinese users [$(M$ (Malay) = 5.70, M (Chinese) = 5.25) and useful (M (Malay) = 5.50, M (Chinese) = 5.05)].

Another interesting revelation from the results is that Malaysian Malays ($M = 5.18$) displayed a higher mean for trust of the virtual electronic commerce store compared to the Malaysian

Chinese ($M = 4.80$). The results contradicts Kamaruddin et al's [12, p. 566] studies which show that Malay shoppers tend to display high ethnocentric emotions compared to Chinese.

6. Conclusion

Limitations

There are some limitations to the study. Firstly, the study forms as an early foray into the effects of gender and ethnicity towards 3D virtual electronic commerce in an immersive online environment. Hence, the results do not indicate the underlying reasons for the causes of the significance relationships found. Second, effects of Malaysians of Indian and indigenous ethnicity have to be dismissed since the number of Indian respondents are too few at only 4 of 273 (4.9%), resulting in insignificant outcomes. Finally, the inability to listen to the audio in the website (due to the lack of headphones) is perceived to have an impact on the results for presence and para social presence.

Future Studies

Future research for 3D immersive electronic commerce should concentrate on finding the underlying causes for the significant results of the gender and ethnicity biases.

Implications

The results of the research have indicated that gender and ethnicity have a huge impact on 3D immersive electronic commerce. Web site designers, marketers, as well as researchers could make use of the early findings to design more suitable 3D web malls or stores which gear towards the targeted niche market for better results.

This study has explored and shown that gender and ethnicity influence users' perception and trust of 3D web malls. It is obvious that with better knowledge and understanding of how 3D immersive web malls or stores are perceived and received by users, more effective sites could be built. The future of the electronic commerce seemed quite positive as the Internet moves towards 3D.

7. References

- [1] Rattner, J. "Virtual worlds - the rise of the Internet," in *Intel Developer Forum*, 2007 Retrieved January 6, 2008 from: http://www.intel.com/pressroom/kits/events/idfall_2007/webcasts.htm#.
- [2] Nichols, S. "IBM to fund '3D internet' project: 3D world research part of \$100m Innovation Jam initiative," in *vnunet.com*, 2006. Retrieved February 9, 2008. from <http://www.vnunet.com/vnunet/news/2168455/ibm-fund-3d-internet-project>
- [3] Konrad, R. "IBM rules govern workers in virtual worlds," in *MSNBC*, 2007. Retrieved

November 9, 2007. from

<http://www.msnbc.msn.com/id/19982107/>

- [4] Maamar, Z. "Commerce, e-commerce, and m-commerce: what comes next," *Communications of the ACM* (46:12) 2003. pp. 251-257
- [5] Lombard, M. and Ditton, T.B. "At the Heart of it All: The Concept of Presence," *Journal of Computer-Mediated Communication*. 1997 (3:2) Retrieved 04 December, 2007 from <http://jcmc.indiana.edu/vol3/issue2/lombard.html>
- [6] Steuer, J. "Defining Virtual Reality: Dimensions Determining Telepresence," *Journal of Communication*, (42:4), pp. 73-93, 1992.
- [7] Schubert, T. Friedmann, F. and Regenbrecht, H. "The Experience of Presence: Factor Analytic Insights," *Presence* (10:3). 2001. pp. 266-281, 2001.
- [8] Kumar, N. and Benbasat, I. "Para-Social Presence and Communication Capabilities of a Web Site," *e-Service Journal* (1:3) 2002. pp. 5-24
- [9] Greenberg, P.A. "And E-Commerce for Her," in *E-Commerce Times*, 2000. Accessed July 13, 2000. from <http://www.ecommercetimes.com/story/3702.html>
- [10] Burnstein, B., Bank, L. and Jarvik, L. "Sex Differences in Cognitive Functioning: Evidence, Determinants, Implication," *Human Development*, (23:August). 1980. pp. 289-313.
- [11] Deaux, K. and Kite, M.E. "Thinking about gender," in *Analyzing Gender: A Handbook of Social Science Research*, B. B. Hess and M. M. Ferree, Eds. Newbury Park, CA: SAGE Publications, 1987, pp. 92-117.
- [12] Kamaruddin, A.R., Mokhlis, S. and Othman, M.N. "Ethnocentrism Orientation and Choice Decisions of Malaysian Consumers: The Effects of Socio-Cultural and Demographic Factors," *Asia Pacific Management Review*, (7:4). 2002. pp. 553-572.
- [13] Davis, F.D. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly*, (13:3) September, 1989, pp. 318-340
- [14] Pavlou, P.A. "Consumer Acceptance of Electronic Commerce: Integrating Trust and Risk with the Technology Acceptance Model," *International Journal of Electronic Commerce*, (7:3) 2003, pp. 69-103
- [15] Bhattacherjee, A. "Individual Trust in Online Firms: Scale Development and Initial Trust," *Journal of Management Information Systems*, (19:1). 2002. pp. 213-243
- [16] Kaluscha, E.A. "The Importance of Initial Consumer Trust in B2C Electronic Commerce A Structural Equation Modeling Approach," in *Fakultät für Wirtschaftswissenschaften und Informatik: Universität Klagenfurt*, 2004, pp. 336.

- [17] Nunnally, J.C. *Psychometric Theory*, New McGraw-Hill, York. 1967.p.640
- [18] Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R.L. *Multivariate Data Analysis*, 6 ed. Pearson, Upper Saddle River, N.J., 2006.
- [19] Guildford, J.P., *Psychometric Methods*. McGraw Hill, New York, 1956.
- [20] Klein, P. *An Easy Guide to Factor Analysis*. London, Routledge, New York. 1994.
- [21] Wolfinbarger, M. and Gilly, M.C. "Shopping Online for Freedom, Control and Fun," *California Management Review*, 2001. (43:2), pp. 34-35.
- [22] Calder, B.J., Phillips, L.W., and Tybout, A.M., "Designing Research for Application," *Journal of Consumer Research*, (8:2) 1981. pp. 197-207
- [23] Sharif, R. "Malaysian Surfers: Online Banking is Hot, shopping So-So," in *The Star*. Petaling Jaya, 2004. Accessed January 6, 2005. from <http://www.thestar.com.my>
- [24] Bühner, M., *Einführung in die Test- und Fragebogenkonstruktion*. Pearson: München., 2004.
- [25] Jöreskog, K.G. and Sörbom, D. *LISREL® 8: User's Reference Guide*. Scientific Software International. Chicago, 1996.
- [26] Homburg, C. and Giering, A. "Konzeptualisierung und Operationalisierung komplexer Konstrukte," *Marketing - ZFP*, (18:1). 1996. pp. 5-24.
- [27] Klein, R.B. *Principles and Practice of Structural Equation Modeling*. Guildford Press. New York. 1998.
- [28] Suh, B. and Han, I. "Effect of Trust on Customer Acceptance of Internet Banking," *Electronic Commerce Research and Applications*, (1:3) 2002 pp. 247-263.
- [29] Bentler, P.M. "Comparative Fit Indexes in Structural Models," *Psychological Bulletin*, (107:2) 1990. p.p. 238-246
- [30] Einwiller, S., *Vertrauen und Reputation im elektronischen Handel*. Difo-Druck GmbH. Bamberg, 2002.
- [31] Hancock, G.R. and Freeman, M.J. "Power and Sample Size for the Root Mean Square Error of Approximation Test of Not Close Fit in Structural Equation Modeling," *Educational and Psychological Measurement*, (61:5). 2001. pp. 741-758
- [32] Fornell, C and Larcker, D.F. "Evaluating Structural Equation Models with Unobserved Variables and Measurement Error," *Journal of Marketing Research*, (18:1) 1981, pp. 39-50
- [33] Kilbourne, W. and Weeks, S. "A Socioeconomic Perspective on Gender Bias in Technology," *Journal of Socio-Economics*, (26:1) 1997. pp. 243-260
- [34] Tannen, D. *You just don't understand women and men in conversation*. Ballantine Books New York, 1994.
- [35] Tannen, D. "The Power of Talk: Who Gets Heard and Why," *Harvard Business Review*, (73:5) 1995. pp. 138-148
- [36] Gefen, D. and Ridings, C.M. "If You Spoke as She Does, Sir, Instead of the Way You Do: A Sociolinguistics Perspective of Gender Differences in Virtual Communities," *The DATA BASE for Advances in Information Systems*, (36:2) 2005. pp. 78-92
- [37] Dabbs, J.M, Chang, E.L., Strong, R.A. and Milum, R. "Spatial ability, navigation strategy, and geographic knowledge among men and women," *Evolution and Human Behaviour*, (19:2) 1998, pp. 89-98
- [38] Gron, G., Wunderlich, A.P., Spitzer, M. Tomczak, R. and Riepe, M.W. "Brain activation during human navigation: Gender-different neural networks as substrate of performance," *Nature Neuroscience*, 2000 (3:4), pp. 404-408
- [39] Turkle, S. "Computer Reticence: Why Women Fear the Intimate Machine," in *Technology and Women's Voices*, C. Kramarae, (ed). Routledge Kegan Paul. New York, 1988, pp. 41-61.
- [40] Roper Center for Public Opinion and Research, 1998 Retrieved January 21 2007. from <http://www.ropercenter.uconn.edu>
- [41] Slyke, C.V., Comunale, C.L. and Belanger, F., "Gender differences in perceptions of web-based shopping," *Communications of the ACM*, (45:2) 2002. pp. 82-86
- [42] Le Ferle, C., Edwards, S. and Lee, W. "Teens' use of traditional media and the Internet," *Journal of Advertising Research*, (4:3) 2000. pp. 55-64
- [43] Odell, P.M., Korgen, K.O., Schumacher, P. and Delucchi, M. "Internet use among female and male college students," *CyberPsychology and Behaviour*, (3:5) 2000 pp. 855-862
- [44] Madell, D. and Muncer, S. "Gender Differences in the Use of the Internet by English Secondary School Children," *Social Psychology of Education*, (7:2) 2004. pp. 229-251
- [45] Kehoe, C., Pitkow, J. and Morton, K. "Eighth WWW User Survey," 1997. Retrieved 12 November 2002 from http://www.cc.gatech.edu/gvu/user_surveys/survey-1997-04/

[46] Gould, E.W., Zakaria, N. and Afendi, S.M.Y.
"Applying Culture to Website Design: A
Comparison of Malaysian and US Websites,"
presented at Proceedings of IEEE professional
communication society international professional
communication conference and Proceedings of the
18th annual ACM international conference on
Computer documentation: technology & teamwork
Cambridge, Massachussets, 2000. pp. 161-171

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