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Ethnic Dimensions of Attitudes Towards Computers in Developing Societies: Computer Anxiety and PC Involvement[1]

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Abstract

Information systems (IS) are implemented within a social context made up of economic, political, cultural and behavioural factors which differ greatly between societies. Failure to account for such differences can inhibit information technology (IT) adoption. The social contexts of developing countries differ from each other and from those of developed nations. To illustrate some of the behavioural differences between developing societies which contribute to the social context of IS implementations, this study examined the computer anxiety and involvement with Personal Computers (PCs) of six groups of computer-using students from China, Hong Kong, Malaysia, New Zealand, Tanzania and Thailand. Differences were found to exist between the computer anxiety of some of the groups but they were probably attributable to demographic factors. Differences were found to exist between the PC involvement of some of the groups which could be attributed to ethnic factors. Implications for research and practice are drawn.

1. Introduction

Developing countries are increasingly deploying IT to solve their developmental problems. Lending for IT by the World Bank has been growing at six times the growth rate of total Bank lending, and is present in 90% of the Bank's lending operations. The extent of IT's impact on World Bank development efforts has been rated great or very great by 79% of projects [1]. However, overall use of IT in developing countries remains at a far lower level than in the developed nations. For example, Tokyo has more telephones than the entire African continent [2].

Whilst the provision of the technology is a necessary condition for achievement of the benefits which IT can bring, there is mounting evidence to suggest that this is not sufficient in itself. Changes in the behaviour of individuals and organisations are also required [3]. When the application of IT fails to account for the behaviour of its users, especially insofar as that behaviour should change, then disappointing results, or even failed applications can result [2]. Many factors will affect the behaviour of individuals who have the opportunity to use a computer and the influence which attitudes have on individual behaviour has been well documented [4].

Influences on behaviour may also arise from organisational culture [5] or from national culture [6]. The implementation of IT in developing countries is often characterised by a transfer of technology from one culture to another. In aid situations this transfer is often in the form of a donation from a developed country with a western (European) culture to a developing country with a non-western (African, Asian or Latin-American) culture. In such cases, assumptions regarding the changes in behaviour which are required to make the technology successful may not be as valid in the recipient culture as

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they may have been in the donor culture. For example, senior management in Pakistan rejected a national computerised land management system because they were expected to use it for strategic planning, forecasting and decision support even though they belong to a culture in which meticulous forward planning is not emphasised and in which risk-taking and fatalism are valued [7].

National cultures are often formed from the aggregation of ethnic cultures which often do not coincide with national boundaries. This is especially true in, but not confined to, post-colonial nations, many of which are classified as developing countries. Moreover, many developed nations, whose national cultures might be thought to be fairly homogeneous, in fact contain significant minority populations who often consider themselves ethnically and culturally distinct from both the majority population and from each other. Examples include Australian Aborigines, New Zealand Maoris, and the immigrant communities of several European countries. In all cases, individual behaviour is culturally patterned, and in many cases, some catastrophically so, by ethnic differences.

Among the many aspects of attitudes towards computers which are known to influence computer-related behaviour, two are chosen for examination in the present study. Computer anxiety or technophobia tends to inhibit computer use and has been found to be related to a consistent pattern of response towards computers, viz. lower expectations, poorer performance, more subjective anxiety and a higher frequency of debilitative thoughts [8]. On the other hand, involvement with computers has been shown to have a positive effect on computer-usage behaviour by individuals. Moreover, involvement with a product such as PCs can be simultaneously psychological and behavioural. Product involvement represents a continuum that ranges from total apathy to extreme enthusiasm, and whilst not being observable, it does produce observable behavioural outcomes [9]. For example, Paré and Elam [10] found computer-related activities, such as watching TV documentary programmes about computers and consulting computer-oriented magazines, to be among the dominant predictors of PC usage. Bloch [9] defines product involvement as an unobservable state reflecting the amount of interest, arousal, or emotional attachment a consumer has with a product. Product enthusiasm gives rise to early adoption of new products and desire for the latest technology [9].

The current research measured the computer anxiety and PC involvement of a number of different ethnic groups of computer users. Six groups of tertiary-level students, totalling 279 respondents, from China, Hong Kong, Malaysia, New Zealand, Tanzania and Thailand, were asked twenty questions about their feelings towards computers. Hong Kong and New Zealand are not classified as developing nations. Hong Kong was included in the study in order to provide the opportunity for comparing the results with at least one developed nation. The subjects from New Zealand were all of Maori extraction, and as such represent an economically disadvantaged and ethnically distinct group which can be regarded as a developing society.

University students were selected for the study as a convenience sample, but also as they represent future professionals who are likely to be well-positioned to make good use of computers in their careers, though major behavioural changes may be required [11]. In the next section, we describe the six groups of students and their cultural backgrounds. Following this, we employ analysis of variance and partial least squares to analyse the data collected from the students.

2. Country profiles

Table 1 provides summary demographic and economic statistics for the countries included in the study. Subsequent sub-sections provide a brief description of the political, economic and cultural background of each country.

Table 1. Demographic and economic statistics

	Population '000 [1]	GNP per Capita: $US[1]	Tele-phones per '000[2]
Hong Kong	5,865	17,860	510
Thailand	58,824	2,040	37
Malaysia	19,032	3,160	126
China	1,175,359	490	15
Tanzania	26,743	100	3
New Zealand	3,462	12,900	460

[1]The World Bank Atlas[12]. [2]Connors [13]

2.1 Peoples' Republic of China (PRC)

The forty-eight students in this sample are final year undergraduates in the Department of Journalism, at Jinan University, Guangzhou, one of the largest cities in China, with a population of approximately five million. Journalism students are familiar with word processing, desk top publishing and presentation graphics but not with programming languages. The newspaper industry in China is computerised and journalists require proficiency in Chinese input methods.

University graduates require computing skills as computerisation is common in Guangzhou businesses. Computer-related courses have been offered in

Guangzhou since the early 1980s and many families own a PC. Computer-related activities, such as playing computer games, and reading computer-related magazines or newspapers that focus on the development of technology in the Chinese context, have also become popular. Guangzhou has eight shopping malls selling computers and peripheral products. With a projected 500,000 internet users by the end of 1997, China represents a small but growing segment of the Internet community.

In China, parents place a high value on education and employ a concept roughly translated as "studying is the most highly appreciated activity". Traditionally, Chinese children are expected to care for their parents in later life and parents are motivated towards obtaining the best education they can for their children in order to prepare them for the financial demands of this role.

2.2 Hong Kong

The fifty-three students in the study are final year undergraduates in the Department of English, at the City University of Hong Kong. They use PCs for word processing, desk top publishing and presentation graphics.

IT is an important component of education. All tertiary institutions are well-endowed with computing equipment and home ownership of PCs is high. Hong Kong has the world's highest per capita usage of cellular telephones and radio pagers. The density of radio telephones in 1996 was 19.6 per 100 people, representing an increase of 76% over 1995. The number of fixed telephone lines is also among the world's highest.

Hong Kong, a British colony for 150 years, has recently returned (July 1st, 1997) to Chinese sovereignty. Similarly to their PRC neighbours, Hong Kong parents value education highly, and students are oriented towards academic achievement. Chinese culture is noted for its collectivist characteristic which emphasises the integrity and advancement of the group [14]. Thus, education traditionally focuses on dependence rather than independence, which is manifested in a lack of creativity, learning by rote and memorisation.

2.3 Sarawak (Malaysia)

The thirty-three students in this group are drawn from undergraduates in Universiti Malaysia Sarawak (UNIMAS) in Sarawak, Malaysia's largest state. They are 1st to 4th year students attending a variety of courses, but are all required to take two mandatory courses: End User Computing and Power Tools for Knowledge Workers.

The government's current economic plan envisages Malaysia becoming a fully developed country by the year 2020. A major project is the US$8 billion "cybercity" - Cyberjaya - the world's first "intelligent city", in which all homes will have Internet access and all transactions will be conducted through smart cards. The government intends that Malaysia will be an information-rich society and has identified computer literacy as being essential for progress and development [15]. There were around 310,000 PCs in Malaysia in 1995, a ratio of 16 per 1,000 inhabitants. By October 1996, Malaysia had about 75,000 Internet subscribers, increasing at 20% per month [16].

The students belong to Sarawak's indigenous population, known collectively as Dayaks, which make up half of Sarawak's 1.6 million people. The remainder is made up of Malay and Chinese. Most of the indigenous peoples are only marginally involved in the urban economy [17]. Colonial conditions, culminating in the incorporation of Sarawak into Malaysia, have dramatically altered Dayak societies by placing them in a position of subordination.

2.4 New Zealand - Maoris

The sample of forty-one Maori students are undergraduates at the University of Waikato in New Zealand. They are all enrolled on the Maori language version of a course called The Computing Experience, which provides an introduction to computers and their use.

New Zealand is an advanced user of IT. Almost all schools have computer equipment of some kind with an average of one computer per 18 students. 68% of secondary schools have an Internet connection. New Zealand has the seventh highest number of Internet hosts in the world for every 1,000 people. There is a computer in one in every four homes [18].

Of New Zealand's 3.5 million inhabitants, 11% are Maori. Only a small fraction of these are actively involved with IT, as, resulting from European colonisation, the Maoris have been socio-economically disadvantaged in the past. Although the Maori population is now increasing and their culture is experiencing a flourishing renaissance, most Maori are now urban dwellers and have lost touch with their original culture. Maoris have a positve attitude towards education, which is seen as a means of achieving a better way of life.

2.5 Tanzania

Thirty MBA students from the Faculty of Commerce and Management of the University of Dar es Salaam (UDSM) form our Tanzanian sample. Tanzania provides free education. The first computing degree course was offered in 1974, but after training only 12 Tanzanians, it

ceased to operate in 1984 [19]. The students in the study have taken introductory courses in IT and use PCs, mostly for wordprocessing and spreadsheets. They have also used a group support system at UDSM [20].

Even by African standards, Tanzania's use of IT is underdeveloped. While IT has, in most cases, been easily adopted by Tanzanian organisations, it has failed to improve business performance or helped to achieve strategic goals. There is a serious lack of qualified personnel. Prior to the mid-1980s, Tanzania's policies of African socialism targeted self-sufficiency and the government banned the import of computer equipment. However, a policy of liberalisation and structural adjustment since 1985 has caused the gradual adoption of IT. Although IT penetration remains very low, there has been a dramatic increase in PC use.

The students have different tribal origins, with Swahili as their first or second language and English as their second or third language. Whilst Tanzanian culture is a product of African, Arab, European and Indian influences, traditional African tribal values, which persist among the rural population, are being consciously adapted to modern life.

2.6 Thailand

Seventy-four MBA students from Assumption University in Bangkok form the Thai sample. They are a mix of native Thai and Chinese-Thai, who all speak Thai as a first or second language and English as a second or third.

Thailand's recent dramatic economic transformation has generally not brought an improved quality of life to the rural and urban poor [21]. However, Thailand recently embarked on a government-funded national IT policy which aims to develop a National Information Infrastructure (NII). This is not intended as a technology importation scheme, but rather one where the Thai people develop applications that suit them best. There is a severe shortage of qualified people to implement the NII and it is planned to introduce IT into the educational curriculum from primary school onwards [22].

Thai-Chinese have traditionally been the most economically successful but have been readily assimilated into Thai culture. Because of free inter-marriage between ethnic Thais and Chinese, it is difficult, in the cities especially, to identify anyone as a "pure" member of either group. The majority of Thais are Buddhist, and Thai intellectuals have espoused a "Buddhist Road to Development" as an independent, indigenous, model which relates development to religious goals [23].

3. The study

A questionnaire (appendix A) was distributed to the subjects. It asked a number of demographic questions as well as those relating to the instruments for measuring computer anxiety and product involvement (with PCs). The instrument to measure computer anxiety was taken from Igbaria [24] and has been found to have high internal consistency and reliability in prior empirical studies. The instrument asks individuals to indicate their agreement or disagreement with 10 statements reflecting anxiety, apprehension, confusion, hesitation etc. in using computers. The response options are anchored on a five point Likert-type scale. Product involvement with PCs (PC involvement) was measured using an adapted version of a scale developed by Bloch [25]. The response options are also anchored on a Likert-type scale.

In order to test for the existence of a difference between the attitudes which the study subjects held towards computers, the research took the form of 16 hypotheses as follows:

H 1: Students will differ significantly with regard to their computer anxiety according to their ethnic background.
H 2: Students will differ significantly with regard to their PC involvement according to their ethnic background.
H 3: Students will differ significantly with regard to their computer anxiety according to their gender.
H 4: Students will differ significantly with regard to their PC involvement according to their gender.
H 5: Students will differ significantly with regard to their computer anxiety according to their father's occupation.
H 6: Students will differ significantly with regard to their PC involvement according to their father's occupation.
H 7: Older students will be significantly more involved with PCs than younger students.
H 8: Older students will be significantly less anxious about computers than younger students.
H 9: Students with more computing experience will be significantly more involved with PCs than students with less computing experience.
H 10: Students with more computing experience will be significantly less anxious about computers than students with less computing experience.
H 11: Students to whom computers are more available will be significantly less anxious about computers than students to whom computers are less available.
H 12: Students to whom computers are more available will be significantly more involved with PCs than students to whom computers are less available.
H 13: Students who are more involved with PCs will be significantly less anxious about computers than students who are less involved with PCs .
H14: Students from Hong Kong will be significantly more involved with PCs than students from the developing societies.

H15: Students from Hong Kong will be significantly less anxious about computers than students from the developing societies.
H16: Students from more economically advanced countries will be more likely to feel predisposed towards the use of computers than those from less economically advanced countries.

4. Data analysis

4.1 Scales and subjects

Subjects were gathered from universities in six countries. Summary statistics are shown in appendix B. Scale reliability for the measurement instruments was assessed with Cronbach's alpha [26], for which a minimum value of 0.7 is generally acceptable. The PC involvement scale achieved an alpha of 0.82, and the computer anxiety scale achieved a value of 0.84.

4.2 Analysis of variance

The first six hypotheses were tested using analysis of variance, or ANOVA, which is a method of testing the null hypothesis that several group means are equal in a population, by comparing the sample variance estimated from the group means to that estimated within the groups. One of the assumptions required for this test is that the variances of the groups in their populations are equal, and this is tested using the Levene test for homogeneity of variances [27].

If the observed significance of the test is small, the null hypothesis, that all variances are equal, can be rejected. For the computer anxiety variable, the Levene statistic was 1.734 with degrees of freedom of 5 and 273, and significance of .127. For PC involvement, it was 1.981, with significance of .082. Both levels of significance are considered large enough that the null hypothesis cannot be rejected and there is therefore insufficient evidence to suspect that the variances are unequal. The results of the ANOVA analyses for each of the ethnic, gender and fathers' occupation groups are shown in tables 3, 4 and 5.

Table 3. ANOVA for ethnic groups

		Sum of Squares	df	Mean Square	F	Sig.
Computer Anxiety	Between Groups	21.230	5	4.246	8.353	.000
	Within Groups	138.774	273	.508		
	Total	160.004	278			
PC Involvement	Between Groups	15.439	5	30.88	9.444	.000
	Within Groups	89.257	273	.327		
	Total	104.696	278			

Table 4. ANOVA for gender

		Sum of Squares	df	Mean Square	F	Sig.
Computer Anxiety	Between Groups	8.699	1	8.699	15.93	.000
	Within Groups	151.304	277	.546		
	Total	160.004	278			
PC Involvement	Between Groups	4.464	1	4.464	12.34	.000
	Within Groups	100.233	277	.362		
	Total	104.696	278			

The results are interpreted by examining the significance levels of the *F* statistic, which is the ratio of the within-groups mean square and the between-groups mean square. If the means of the groups are similar, the ratio approaches 1. The significance level is based on the *F* value and the degrees of freedom for the two mean squares. If this is small, say .05 or less, the null hypothesis, that the means are the same, can be rejected.

Table 5. ANOVA for father's occupation

		Sum of Squares	df	Mean Square	F	Sig.
Computer Anxiety	Between Groups	5.167	7	.737	1.291	.255
	Within Groups	154.841	271	.571		
	Total	160.004	278			
PC Involvement	Between Groups	3.577	7	.511	1.369	.218
	Within Groups	101.119	271	.373		
	Total	104.696	278			

Hypotheses 1 and 2, which suggest that the students differ with regard to their PC involvement and computer anxiety according to their ethnic background, are supported, as the low values of the *F* significance suggest that their means are different. Hypotheses 3 and 4, which suggest that the students differ with regard to their PC involvement and computer anxiety according to their gender, are also supported, because of the low values of

F. Hypotheses 5 and 6, however, which suggest that the students differ with regard to their PC involvement and computer anxiety according to their father's occupation, are not supported, as the higher values of both the *F* significances suggest that their means are not different.

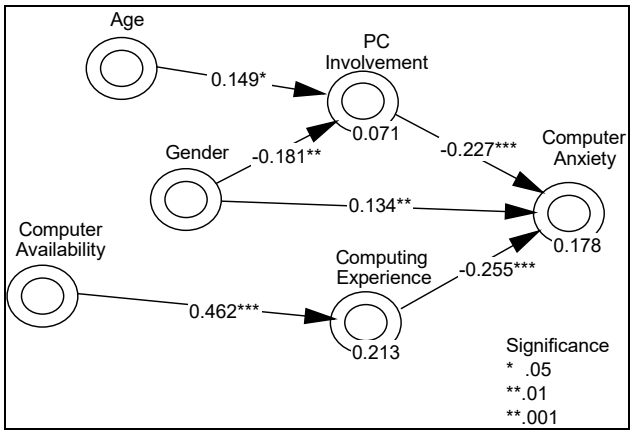
4.3 Partial least squares analysis

Whilst ANOVA is suitable for testing for differences between several population means, it does not provide information to suggest any causal factors for such differences. Structural equation modelling is a methodology for specifying, estimating, and testing hypothesised interrelationships among variables in the behavioural and social sciences [28]. The technique enables the researcher to estimate direct, indirect and total structural effects that might enhance the understanding of relationships among variables within a specific context [29].

Partial Least Squares (PLS) is a second-generation multi-variate analysis technique which performs factor analysis and regression analysis simultaneously [30]. Figure 1 shows the results of PLS tests for hypotheses 7-13.

Figure 1. PLS analysis for hypotheses 7-13

The diagram only shows paths which are both substantive (path coefficient >0.1) and significant (p=.05 or better). Age is seen to influence PC involvement positively, in that older students are more likely to be involved with PCs than are younger ones. This supports hypothesis 7. The analysis did not support a relationship between age and computer anxiety, contrary to hypothesis



8, nor did it support hypothesis 9, which suggested that students with more computing experience will be more involved with PCs than students with less computing experience. However, hypothesis 10 receives support, suggesting that students with more computing experience will be less anxious about computers than students with less computing experience. Hypothesis 11, which suggested that students to whom computers are more available will be less anxious about computers than students to whom computers are less available, was not supported, and neither was hypothesis 12, which suggested that students to whom computers are more available will be more involved with PCs than students to whom computers are less available. PC involvement displayed an inverse and significant influence on computer anxiety, in support of hypothesis 13.

As PLS allows the researcher to re-specify the model after hypothesis testing, in order to test for additional relationships [31], it was decided to test an influence from computer availability upon computing experience. A strong and significant relationship was discovered, suggesting that subjects who enjoyed a greater availability of computers claimed higher levels of computing experience than those who did not. Intuitively, one would expect such a result. Its significance within the current context draws from the strength of the influence, combined with that of experience on computer anxiety, suggesting that computer availability can lead to the alleviation of computer anxiety.

4.4 Multiple comparisons

A significant *F* value in the ANOVA analysis indicates only that the means of the populations from which the groups are drawn are not equal. It does not indicate which pairs of groups differ. As the null hypothesis is rejected if any two means of the groups in the test are unequal, a multiple comparison test is required to determine which means differ significantly from the others. To do this, Tukey's Honestly Significant Difference tests were performed. The tests reveal that the Tanzanian group displays the most significant differences with the other groups on both computer anxiety and PC involvement. Tables 6 shows the results for this group.

Table 6. Tukey's honestly significant difference tests for the Tanzanian group

	Computer Anxiety		PC involvement	
	Mean Diff	Sig	Mean Diff	Sig
Hong Kong	-1.0257*	.000	.7650*	.000
Thailand	-.6524*	.000	.6190*	.000
Sarawak	-.6139*	.008	.2206	.645
PRC	-.7670*	.000	.4058*	.028
Maori	-.7883*	.000	.5698*	.000

*Significant at .05.

In order, therefore, to test that the overall differences were not due solely to the differences which this group displayed, a further ANOVA test was conducted without the Tanzanian data. The results are shown in Table 7. The low value of both the *F* significance figures suggest that even after excluding the Tanzanians, the remaining ethnic groups still differ significantly on both variables, more so for PC involvement than for computer anxiety.

The results of the multiple comparisons for the Hong Kong group were used to test hypotheses 14 and 15, that they would differ from the other groups by being more involved and less anxious. The results contradict the hypotheses, as differences are evident, but in the opposite direction from that expected. Also the differences do not exist for all the groups. To test hypothesis 16, that students from more economically advanced countries would be more predisposed towards the use of computers than those from less economically advanced countries, an index of predisposition was calculated for each group by subtracting their mean score for computer anxiety from their mean score for product involvement. The rationale is that involvement provides a positive inducement for computer use, whilst anxiety is an inhibitor, or negative inducement. The index was used to rank each group and was then compared to their ranking according to the GNP per capita of each country. The results appear in Appendix C.

Table 7. ANOVA for ethnic groups without the Tanzanians

		Sum of Squares	df	Mean Square	F	Sig.
Computer Anxiety	Between Groups	5.305	4	1.326	2.562	.039
	Within Groups	126.286	244	.518		
	Total	131.591	248			
PC Involvement	Between Groups	7.396	4	1.849	5.432	.000
	Within Groups	83.058	244	.340		
	Total	90.455	248			

The relationship of rank orders fails to support hypothesis 16, as it is the inverse of what was expected, suggesting that the students from poorer countries feel more predisposed to use computers than those from richer countries. However, caution is advised in this interpretation, as other differences, such as demographics, could account at least in part for the relationship we have found.

5. Discussion

The results provide moderate support for the hypotheses as there is insufficient evidence to reject seven out of the 16. Ethnicity appears as a possible influence on both computer anxiety and PC involvement, as does gender, but close examination reveals the interplay of other probable factors. The Tanzanian subjects displayed the most significant differences compared to the other groups on both dimensions. The Thai and Hong Kong groups form the only other pair to exhibit significant differences on the computer anxiety dimension but the levels of PC involvement varied considerably among the groups. Next to the Tanzanians, the Hong Kong group varied the most from the others on PC involvement, notably so from the PRC group.

Differences with the Tanzanian group may be accounted for in part by their demographics. Their means suggest they have the lowest levels of anxiety and the highest levels of involvement of all the groups. However, they registered the lowest levels of both computer availability and computing experience, which presents a paradox as both factors overall appear to attenuate anxiety. However, age and gender are seen to induce involvement, which in turn also attenuates anxiety, as does age directly, and it is probable that this combination of influences works most strongly for the Tanzanian group, which is the oldest and which is dominated by men.

The picture with the Hong Kong subjects seems to be the converse of that with the Tanzanians. The Hong Kong group is the second youngest, contains a high proportion of females and registered the highest mean level of anxiety and the lowest mean level of involvement. However, they also claimed the highest levels of both computer availability and computing experience. Whilst overall, experience tends to alleviate anxiety, it appears not to do so for the Hong Kong group, and again it is probable that age and gender exhibit the strongest influences for them.

Differences between the levels of computer anxiety among the groups are mainly exhibited by the Tanzanians, and they appear to be attributable to demographic factors. Reasons for the differences between the groups with regard to their PC involvement are less clear. For the Tanzanians, they are probably also attributable to demographic factors, but the differences between the other five groups are not so easily explained as they are all quite similar demographically.

Overall, the PLS analysis confirms previous research which suggests that women are more likely to be anxious about using computers than men [24]. However, caution is indicated with regard to this conclusion in that the study subjects were drawn from a variety of courses and levels of study. The PLS analysis explained 17.8 % of the variation in computer anxiety, with computing experience

and PC involvement (inversely) having the strongest influence. The women in the study also appeared to be less involved with PCs than did the men. Differences between the subjects were sought along the dimension of their father's occupation, as an indicator of the social and economic status of the subjects' families, but were not found. Age exhibited an influence on PC involvement in the older students who displayed a slightly stronger level of involvement than did the younger students.. However, the PLS analysis explains a very small amount of the variation in PC involvement (7.1%), so there are clearly other factors at work.

Computing experience did not appear to influence PC involvement, but it displayed a significant inverse relationship with computer anxiety. The availability of computers did not register any influence on either PC involvement or computer anxiety, but the PLS analysis revealed a strong, direct and highly significant influence from availability to computer experience, explaining 21.3% of the variation in experience.

The inclusion of the Hong Kong students enabled a comparison of the results from a developed society with those from a less developed society. Contrary to expectations, the Hong Kong group were significantly more anxious than two other groups (Thailand and Tanzania) and were less involved than three others (Tanzania, Sarawak and China). The results seem to suggest that such differences are more easily accounted for from the demographic makeup of the groups than from either their cultural or economic background.

6. Conclusions

The purpose of this study was to illustrate the existence of differences between the social, political, cultural and behavioural factors which form the contexts within which IT is used, especially in development scenarios. Data was collected relating to a specific aspect of the behavioural components of computer use in order to illustrate two such differences. The study failed to find differences between the computer anxiety of different ethnic groups which might be attributable to their ethnicity, but revealed differences between the PC involvement of the groups which might be so attributable.

It has been shown that computer anxiety can be alleviated by experience of computer use, which, not surprisingly, is induced by having a computer available. In practice, this would imply one PC per potential user for maximum availability, and the study provides empirical evidence for the benefit of this level of provision. However, the absence of an influence of availability on computer anxiety directly, testifies to the importance of PCs actually being used rather than just being provided.

Contrary to expectations, the study was unable to expose any differences in the levels of the variables of interest which might be accounted for by the economic background of the subjects, as indicated by their father's occupation. However, the inverse relationship between the subjects' apparent predisposition towards computers and the economic status of their country was a surprising result, and presents a challenge for further research to establish the extent to which such a relationship exists among the wider populations and the reasons for it.

The study serves to alert IS practitioners working on development projects to some of the inhibitors to IT adoption which they might encounter as they deal with a variety of cross-cultural interactions. Variations could exist in the rate and level at which different ethnic groups become psychologically involved with PCs, and this may inhibit their adoption. Age and gender appear to have an influence, but they only explain a small proportion of the variation in PC involvement. Additionally, as there will be little control over such factors, it is necessary to identify others which are capable of inducing involvement, and which are attuned to the culture in which they are to be applied. As professional workers (represented by the students in the study) stand to gain the most from PC technology, IS professionals should implement measures to induce involvement among them. Further research is required in order to identify factors that influence PC involvement, as well as finding culturally sensitive methods for inducing it.

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Appendix A. The Questionnaire

1. Demographic Questions

1.1 How old are you (to the nearest year) ?
1.2 What gender are you ? Male; Female.
1.3 How much experience of using computers have you had ?
1=None, 2=Not much, 3=Some, 4=Quite a lot, 5=A lot.
1.4 When you need to use a computer, is there one available:
1=Never, 2=Not Often, 3=Sometimes, 4=Often, 5= Always ?
1.5 Which of the following categories best describes the occupation of your father ?1=Manual, 2=Clerical, 3=Professional, 4=Technical, 5=Trade/Business, 6=Other ?

Product Involvement

2.1 When I am with friends, we often talk about personal computers.
2.2 I regularly read magazines and newspaper articles about personal computers.
2.3 I am confident about understanding most of what I read or hear about personal computers.
2.4 I like to own a personal computer of my own.
2.5 I believe it is necessary to keep my knowledge about personal computing up to date.
2.6 I believe personal computers are important in today's world.
2.7 I enjoy using a personal computer.
2.8 I would like to use a PC for more of my regular tasks.
2.9 I would watch a TV programme about new developments in personal computing.
2.10 I often take a close look at PCs, peripherals and software in shops and/or catalogues.

3. Computer Anxiety

3.1 I am not at all confident that I could learn computer skills.
3.2 I am unsure of my ability to learn a computer programming language.
3.3 I will not be able to keep up with important technological advances in computers.
3.4 I feel apprehensive about using a computer.
3.5 If given the opportunity to use a computer, I am afraid that I might damage it in some way.
3.6 I have avoided computers because they are unfamiliar to me.
3.7 I hesitate to use a computer for fear of making mistakes that I cannot correct.
3.8 I am unsure of my ability to interpret a computer printout.
3.9 I have difficulty understanding most technological matters.
3.10 Computer terminology sounds like confusing jargon to me

Appendix B. Summary statistics

Ethnic Group	Gender			Mean Age	Mean Availability (1-5)	Mean Experience (1-5)	Father's Occupation						Computer Anxiety		PC Involvement	
	M	F	Total				Manual	Clerical	Professional	Technical	Trade/ Business	Other	Mean	SD	Mean	SD
Hong Kong	8	45	53	22.4	4.4	3.7	9	5	1	11	10	17	2.80	.56	3.43	.47
Thailand	27	47	74	26.3	3.9	3.3	0	0	5	2	52	12	2.43	.75	3.57	.66
Tanzania	28	2	30	35.9	2.7	2.5	10	1	7	0	3	9	1.78	.66	4.19	.46
Sarawak	15	18	33	21.4	3.4	3.1	8	4	3	2	0	16	2.39	.69	3.97	.49
PRC	12	36	48	22.5	2.9	2.7	3	16	11	8	8	2	2.55	.75	3.79	.63
Maori	22	19	41	30.6	3.1	2.6	16	1	13	1	5	0	2.56	.84	3.62	.59
Total	112	167	279	26.0	3.5	3.1	46	27	40	24	78	56	2.47	.76	3.70	.61

Appendix C. Comparison of GNP per capita and predisposition index

Rank by GNP per capita	Country	GNP per Capita $US	Mean Computer Anxiety	Mean PC Involvement	Predisposition Index	Rank by Predisposition Index
1	Hong Kong	17,860	2.8	3.43	0.63	6
2	New Zealand	12,900	2.56	3.62	1.06	5
3	Malaysia	3,160	2.39	3.97	1.58	2
4	Thailand	2,040	2.43	3.57	1.14	4
5	China	490	2.55	3.79	1.24	3
6	Tanzania	100	1.78	4.19	2.41	1