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ANXIETY AND INVOLVEMENT: CULTURAL DIMENSIONS OF ATTITUDES TOWARDS COMPUTERS IN DEVELOPING SOCIETIES[1]

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ABSTRACT

Information systems (IS) are implemented within a social context consisting of economic, political, cultural and behavioural factors which differ greatly between societies and countries. Failure to take account of such differences can inhibit adoption of information technology (IT) and increase the risks of failure for system implementations. Developing societies are particularly vulnerable to such risk as their social contexts exhibit considerable differences, not only from the developed nations but also among themselves. 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 which 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 cultural factors. Implications for research and practice are drawn.

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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 (Hanna, 1993). 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 (Harris, 1995).

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 (Nelson, 1990). 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 (Harris, 1995). 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 (Bagozzi, 1992).

Influences on behaviour may also arise from organisational culture (Geertz, 1973) or from national culture (Hofstede, 1985). 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 they may have been in the donor culture. For example, Galliers et al. (1994) describe a national computerised land management system in Pakistan which was rejected by senior management seemingly 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.

National cultures are often formed from the aggregation of ethnic cultures which may 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 of as 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 (Igbaria and Nachman, 1990). On the other hand, involvement with computers has been shown to have a positive influence 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 (Bloch, 1986). For example, Paré and Elam (1995) 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 (1986) 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 (Bloch, 1986).

This research measured the computer anxiety and PC involvement of a number of different cultural 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 culturally 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 (Panko, 1988). 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.

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]	Telephones 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, 1995. 2. Connors, 1997

Peoples' Republic of China (PRC)

The forty-eight students in this sample were final year undergraduates in the Department of Journalism, at Jinan University, Guangzhou, where Mandarin is the official medium of instruction. Journalism students typically have moderate exposure to PC software, being familiar with word-processing, desk top publishing and presentation graphics but not with programming languages. Particular attention is paid to Chinese computing, since the newspaper industry in China has been computerised for many years and journalists require proficiency in Chinese input methods.

Guangzhou is one of the largest cities in China with a population of approximately five million. With the "open door" policy now practised in China and the promotion of trade and business in Guangzhou, the

financial situation of its citizens has improved considerably in recent years. Generally in China, parents place a high value on education and employ a concept roughly translated as "studying is the most highly appreciated activity". University graduates need to be well equipped with computing skills as computerisation has become very popular in Guangzhou businesses. Computer-related courses have been offered in Guangzhou since the early 1980s and there is an increasing trend for families in Guangzhou to have a PC at home. 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; as in Hong Kong, much of the software is pirated. With an estimated 500,000 individual Internet users in China (about half through universities), by the end of 1997, China represents a small but growing segment of world-wide Internet users.

Hong Kong

The fifty-three students in the study were final year undergraduates in the Department of English, at the City University of Hong Kong. They were all Cantonese speakers with English as a second language. They enjoyed moderate exposure to PC software for the purposes of word-processing, desk top publishing and presentation graphics.

Hong Kong, a British colony for 150 years, recently returned (July 1st, 1997) to Chinese sovereignty. Its population is largely of migrant stock, with many of the present older generation arriving after the end of World War II and the civil war that brought the Chinese Communist Party to power in 1949. As in the PRC, Hong Kong Chinese parents place a high value on education, and students tend to be highly oriented towards academic achievement. A higher level of education increases the chance of joining a more secure and respectable profession, as well as enabling children to support their parents later in life. Chinese culture is also noted for its collectivist characteristic where the paramount concern is for the integrity and advancement of the group (Bond and Wang, 1981). Thus, education traditionally focuses on dependence rather than independence, and this can be manifested in a lack of creativity, with learning by rote.

IT is considered important for education, with all tertiary-education institutions being well-endowed with equipment. Popular technology adoption within Hong Kong extends to pagers, mobile phones and other devices which provide information to an information-hungry population. Hong Kong has the world's highest per capita usage of cellular telephones and radio pagers. In 1996, the government reported a density of radio telephones of 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.

Sarawak (Malaysia)

The thirty-three students in this group were drawn from undergraduates in Universiti Malaysia Sarawak (UNIMAS) in Sarawak, Malaysia's largest state. They were 1st to 4th year students attending a variety of courses, but were all required to take two mandatory courses: End User Computing and Power Tools for Knowledge Workers, whereby they were exposed to various PC computing packages as well as the Internet. All the students in the study belonged to Sarawak's indigenous population and are known collectively as Dayaks, who make up about 49% of Sarawak's 1.6 million people. Most of the Dayak indigenous peoples are still only marginally involved in the urban economy (Brookfield et al., 1995). Colonial conditions, culminating in the incorporation of Sarawak into Malaysia, have dramatically altered Dayak societies by placing them in a position of subordination.

In May, 1996, the Malaysian Government announced its Seventh Malaysia Plan which is intended to provide a springboard for the ambitious "Vision 2020" by which Malaysia intends to become a fully developed country. One component of this plan is the US$8 billion "cybercity" - Cyberjaya - the world's first "intelligent city", to be built near Kuala Lumpur, in which all homes will have Internet access and all transactions will be conducted through smart cards. A key concern of the government is that the benefits of growth are equitably shared among all ethnic groups and states (Wong, 1996). As it is an avowed government aim that Malaysia must be an information-rich society, computer literacy has been identified as essential for the country to progress and develop (Mohamad, 1991).

The Seventh Plan points out that the number of PCs in the country increased from 160,000 in 1990 to 310,000 in 1995, putting the ratio at around 16 per 1,000 inhabitants. By October 1996, it was reported

that Malaysia had about 75,000 Internet subscribers with growth rates of 20% per month (Ponniah, 1996).

New Zealand - Maoris

Our sample of forty-one Maori students were undergraduates at the University of Waikato in New Zealand. They were all enrolled on the Maori language version of a course called The Computing Experience, which provides an introduction to computers and their use. It is intended for students who wish to take only one course in computer science. 11% of New Zealand's 3.5 million inhabitants are Maori, but only a small fraction of these are actively involved with IT, as the Maoris have been socio-economically disadvantaged in the past. This unfortunate situation is changing now, with computer courses run in the Maori language at Waikato University.

The Maori first came to New Zealand some 1,000 years ago, but European colonisation from the late 18th century introduced disease and firearms, and the Maori population plummeted. Although the Maori population is now increasing and Maoritanga (Maori culture) is experiencing a flourishing renaissance, most Maori are now town and city dwellers, and many have lost touch with their original culture. Maori is now an official language of New Zealand, although outside the Maori community it is rare to hear it spoken except on ceremonial occasions. Maori people have established various programmes for the revival of their language, particularly in kindergartens and primary schools.

The attitude of the Maori population towards education is positive, yet as a disadvantaged group, their access to the education system has left something to be desired. As with many minority groups, education is seen as a potential leveraging point to pull them into a better way of life. A small group of skilled Maori people are deeply involved in writing software, getting IT into schools and their community as a way to increase IT use and awareness. However, it will be many years before those who have gone through the pre-school language classes come through the education system to the universities and then into the workforce to make significant differences in the status of the Maori.

Tanzania

Thirty MBA students from the Faculty of Commerce and Management of the University of Dar es Salaam (UDSM) formed our Tanzanian sample. The students held various first degrees and most were

employees of public organisations. All of them are Bantu speakers of 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.

Tanzania offers free education to all its citizens, from primary school to university level. Computing education has been available at tertiary level since 1965, and the first computing degree course was offered in 1974, but after training only 12 Tanzanians, it ceased to operate in 1984 (Mgaya, 1994). The students in the study have taken introductory courses in IT and have had limited exposure to various PC software packages, mostly for word-processing and spreadsheet operations. They have also been able to use a group support system installed in UDSM's Management Decision Centre (Splettstoesser, 1996).

Prior to the mid-1980s, Tanzania's policies of "African socialism" targeted self-sufficiency and limited the use of non-indigenous technologies. In the 1970s, the government banned the import of any computer equipment, and this remained effective until the early 1980s. Since 1985, a policy of liberalisation and structural adjustment has caused the gradual adoption of IT in all sectors of the economy, but IT penetration remains very low. Galilava (1996) reports that 40% of all implemented applications serve financial or accounting functions.

The government has not made any serious attempt to formulate a national IT policy. Despite this, there has been a dramatic increase in microcomputer utilisation in all sectors of the economy during the last ten years. Tanzania has an enormous development workload and a comprehensive and conducive framework for institutional capacity building, which can be strongly supported by IT, is urgently needed.

Thailand

Seventy-four MBA students from Assumption University in Bangkok formed the Thai sample who responded to our questionnaire. Twenty-five of the students were studying full-time and had recently completed their BBA degrees. The remainder were part-time evening students from a wide variety of backgrounds who are working full-time with between two and six years employment experience. They

were typically taking the MBA course in order to win promotion. The students were a mix of native Thai and Chinese-Thai. They all speak Thai as a first or second language and English as a second or third.

Thai-Chinese, who have traditionally been the most economically successful, have been assimilated into Thai culture, partly as a result of government policy which required all children to learn the Thai language in primary school, as well as official pressure to adopt Thai names. Additionally, the lack of religious barriers has allowed free inter-marriage between ethnic Thais and Chinese, to the extent that in the cities especially, it is difficult 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. They express a particular concern for the negative effects of capitalist development in rural areas and advocate a more self-reliant agricultural economy, appropriate technology and even the revival of the co-operative institutions of communal culture (Cohen, 1993).

Thailand's dramatic economic transformation in recent years, seen mostly in the development of Bangkok's goods and services and the expansion of the business and industrial centres, has generally not brought an improved quality of life to the rural and urban poor (Ekachai, 1994). Thailand has recently embarked on a government-funded national IT policy which aims to develop a National Information Infrastructure (NII). It is not intended to be a massive technology importation scheme, but rather one where the Thai people must develop applications that suit them best. The government recognises that there is a severe shortage of qualified people to fill the many jobs that will open up as a result of the NII unfolding and they plan to introduce IT into the educational curriculum from primary school onwards (NITC, 1995).

The Research

A questionnaire (see Appendix) 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 (1990) 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, anchored on a five point Likert-type scale, range from 1 = strongly disagree, to 5 = strongly agree, such that the higher the score, the higher the computer anxiety. Product involvement with PCs (PC involvement) was measured using an adapted version of a scale developed by Bloch (1981) for measuring involvement with motor cars. Bloch (ibid.) has pointed out that the product-specificity of the original instrument should not limit its usefulness in efforts to further refine the construct of involvement. Respondents were asked to rate their agreement with a number of statements on a scale of 1 to 5, where; 1 = strongly disagree and 5 = strongly agree. The higher the score, the higher the involvement with PCs.

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: University students will differ significantly with regard to their computer anxiety according to their cultural background.

H 2: University students will differ significantly with regard to their PC involvement according to their cultural background.

As both culture and attitudes are known to influence individual behaviour, these hypotheses test the relative potency of culture and each attitude. The test is suggested by the observation that social receptivity (of innovations) has consistently been more determinative of the directions taken by technological trends than have the properties or developments inherent in the technology itself (McC. Adams, 1996).

H 3: University students will differ significantly with regard to their computer anxiety according to their gender.

H 4: University students will differ significantly with regard to their PC involvement according to their gender.

Gender has been shown to be associated with attitudes and computer anxiety, but the nature of the association is sometimes contradictory (Igbaria, 1990). This test explores further some of the conditions under which the influence of gender might operate.

H 5: University students will differ significantly with regard to their computer anxiety according to their father's occupation.

H 6: University students will differ significantly with regard to their PC involvement according to their father's occupation.

These tests explore the relationship between social status, expressed by father's occupation, and attitudes towards computers. The test is suggested by the observation that computers are often characterised as a tool for minority elites, especially in developing countries (Hamelink, 1997).

H 7: Older university students will be significantly more involved with PCs than younger students.

H 8: Older university students will be significantly less anxious about computers than younger students.

H 9: University students with more computing experience will be significantly more involved with PCs than students with less computing experience.

H 10: University students with more computing experience will be significantly less anxious about computers than students with less computing experience.

H 11: University students to whom computers are more available will be significantly less anxious about computers than students to whom computers are less available.

H 12: University students to whom computers are more available will be significantly more involved with PCs than students to whom computers are less available.

Demographic and situational factors such as age and computer availability and experience have been shown to influence attitudes towards computers (Igbaria,1990). These tests are used to isolate their influence from the other factors in the study.

H 13: University students who are more involved with PCs will be significantly less anxious about computers than students who are less involved with PCs .

This test is introduced in order to examine some of the antecedents of computer anxiety, of which little is known (Torkzadeh and Angulo, 1992).

H14: University students from Hong Kong will be significantly more involved with PCs than students from the developing societies.

H15: University students from Hong Kong will be significantly less anxious about computers than students from the developing societies.

H16: University 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.

These tests examine the notion that computer users in a developed society are more likely to be willing to use computers than those in developing societies, given the strong correlation between national GDP and

spending on information technology. Connors (1997) illustrates the national differences of the countries represented in the study with an "infostructure index" which ranks countries according to the accessibility of information. Hong Kong ranks fifth out of 147 countries, while Malaysia ranks 67, Thailand 85, China 101 and Tanzania 129 (Connors, 1997).

DATA ANALYSIS

Summary Statistics

Subjects were gathered from universities in six countries. Summary statistics are shown in Table 2.

Table 2. Summary Statistics

Cultural Group	Gender			Mean Age	MCA ^{2} (1-5)	MCE ^{2} (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

Scale Reliability

Scale reliability for the measurement instruments was assessed with Cronbach's alpha (Cronbach, 1951), 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.

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 (Norusis/SPSS, 1993).

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 for testing the differences between the two dependent variables for each of the cultural, gender and fathers' occupation groups are shown in tables 3, 4 and 5.

Table 3. ANOVA for Cultural 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	15.926	.000
	Within Groups	151.304	277	.546		
	Total	160.004	278			
PC Involvement	Between Groups	4.464	1	4.464	12.335	.000
	Within Groups	100.233	277	.362		
	Total	104.696	278			

[2] MCA = Mean Computer Availability; MCE = Mean Computer Experience

Table 5. ANOVA for Father's Occupation						
		Sum of Squares	df	Mean Square	F	Sig.
Computer Anxiety	Between Groups	5.167	5	.737	1.291	.255
	Within Groups	154.841	271	.571		
	Total	160.004	278			
PC Involvement	Between Groups	3.577	5	.511	1.369	.218
	Within Groups	101.119	271	.373		
	Total	104.696	278			

The results of the tests for each hypothesis are summarised in table 6.

Table 6. Results Summary Hypotheses 1 – 6		
Test: If the F ratio is > 1and its significance level at the degrees of freedom for the two mean squares is < .05, the null hypothesis, that the means are the same, can be rejected.	*F* and its Significance	Result
H1: University students will differ significantly with regard to their computer anxiety according to their cultural background.	8.353 (.000)	Supported
H2: University students will differ significantly with regard to their PC involvement according to their cultural background.	9.444 (.000)	Supported
H 3: University students will differ significantly with regard to their computer anxiety according to their gender.	15.926 (.000)	Supported
H 4: University students will differ significantly with regard to their PC involvement according to their gender.	12.335 (.000)	Supported
H 5: University students will differ significantly with regard to their computer anxiety according to their father's occupation.	1.291 (.255)	Not Supported
H 6: University students will differ significantly with regard to their PC involvement according to their father's occupation.	1.369 (.218)	Not Supported
Hypotheses 7 - 13	Coefficient and Significance Level	Result
Test: The path coefficients in the PLS analysis should be both substantive (path coefficient >0.1), significant (at p=.05 or better) and with the correct sign (+/-).		
H 7: Older university students will be significantly more involved with PCs than younger students.	-.149 (.05)	Supported
H 8: Older university students will be significantly less anxious about computers than younger students.	-0.119 (not significant)	Not Supported
H 9: University students with more computing experience will be significantly more involved with PCs than students with less computing experience.	.023	Not Supported
H 10: University students with more computing experience will be significantly less anxious about computers than students with less computing experience.	-0.255 (.001)	Supported
H 11: University students to whom computers are more available will be significantly less anxious about computers than students to whom computers are less available.	.065	Not Supported
H 12: University students to whom computers are more available will be significantly more involved with PCs than students to whom computers are less available.	.040	Not Supported
H 13: University students who are more involved with PCs will be significantly less anxious about computers than students who are less involved with PCs .	-0.227 (.001)	Supported

Hypotheses 14 – 15		
Test: If the F ratio is > 1and its significance level at the degrees of freedom for the two mean squares is < .05, for all comparisons, the null hypothesis, that the means are the same, can be rejected.	Significance Levels	Result
H14: University students from Hong Kong will be significantly more involved with PCs than students from the developing societies.	.042; .000; .096; .452; .598	As only 2 of the 5 significance levels are < .05, not supported
H15: University students from Hong Kong will be significantly less anxious about computers than students from the developing societies.	.715; .000; .000; .020; .570	As only 3 of the 5 significance levels are < .05, not supported

Hypothesis 16				
Test: The index of predisposition for each group (their mean score for product involvement minus their mean score for computer anxiety) should be in the same rank order as the GNP per capita of each group's country.	Hong Kong		Tanzania	
	Rank Order by Predisposition Index	Rank Order by GNP	Rank Order by Predisposition Index	Rank Order by GNP
H16: University 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.	6th	1st	1st	6th
Result: Not supported				

The results of the tests for hypotheses 1-6 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.

Multiple Comparisons

A significant *F* value indicates only that the means of the populations from which the groups are drawn are probably not equal. It does not indicate which pairs of groups are not equal, and the null hypothesis is rejected if any two means of the groups in the test are unequal. A multiple comparison test indicates which means differ significantly from the others. Tables 7 and 8 show the results of Tukey's honestly significant difference test for computer anxiety and PC involvement respectively according to the cultural background groupings. It is evident that the Tanzanian group displays the most significant differences with the other groups on both these variables, as suggested by their means. 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 9. The low value of both the *F* significance figures suggest that even after excluding the Tanzanian subjects, the remaining cultural 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.

Finally, in order to test hypothesis 16, 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 are shown in Table 10.

The relationship of rank orders 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.

Table 7. Tukey's Honestly Significant Difference Test for Computer Anxiety

		Mean Diff	Sig
Hong Kong	Thailand	.3732*	.042
	Tanzania	1.0257*	.000
	Sarawak	.4117	.096
	PRC	.2587	.452
	Maori	.2374	.598
Thailand	Hong Kong	-.3732*	.042
	Tanzania	.6524*	.000
	Sarawak	.0769	1.000
	PRC	-.1146	.954
	Maori	-.1359	.925
Tanzania	Hong Kong	-1.0257*	.000
	Thailand	-.6524*	.000
	Sarawak	-.6139*	.008
	PRC	-.7670*	.000
	Maori	-.7883*	.000
Sarawak	Hong Kong	-.4117	.096
	Thailand	-.077	1.000
	Tanzania	.6139*	.008
	PRC	-.1531	.934
	Maori	-.1744	.902
PRC	Hong Kong	-.2587	.452
	Thailand	.1146	.954
	Tanzania	.7670*	.000
	Sarawak	.1531	.934
	Maori	.0426	1.000
Maori	Hong Kong	-.2374	.598
	Thailand	.1359	.925
	Tanzania	.7883*	.000
	Sarawak	.1744	.902
	PRC	.0426	1.000

*The mean difference is significant at the .05 level

Table 8. Tukey's Honestly Significant Difference Test for PC Involvement

		Mean Diff	Sig
Hong Kong	Thailand	-1.460	.715
	Tanzania	-.7650*	.000
	Sarawak	-.5444*	.000
	PRC	-.3592*	.020
	Maori	-.1953	
Thailand	Hong Kong	.1460	.715
	Tanzania	-.6190*	.000
	Sarawak	-.3984*	.011
	PRC	-.2132	.335
	Maori	.0992	.998
Tanzania	Hong Kong	.7650*	.000
	Thailand	.6190*	.000
	Sarawak	.2206	.645
	PRC	.4058*	.028
	Maori	.5698*	.000
Sarawak	Hong Kong	.5444*	.000
	Thailand	.3984*	.011
	Tanzania	-.2206	.645
	PRC	.1852	.707
	Maori	.3492	.095
PRC	Hong Kong	.3592*	.020
	Thailand	.2132	.335
	Tanzania	-.4058*	.028
	Sarawak	-.1852	.707
	Maori	.1639	.758
Maori	Hong Kong	.1953	.570
	Thailand	.0985	.998
	Tanzania	-.5698*	.000
	Sarawak	-.3492	.095
	PRC	-.1639	.758

*The mean difference is significant at the .05 level

Table 9. ANOVA for Cultural 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			

Table 10. Comparison of GNP per Capita and Predisposition Index						
Rank Order by GNP per capita	Country	GNP per Capita $US	Mean Computer Anxiety	Mean PC Involvement	Predisp-osition Index	Rank Order 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

Partial Least Squares Analysis

Whilst ANOVA is suitable to test for differences between several population means, it does not provide information to suggest any causal factors for such differences. Structural Equation Modelling (SEM) is a methodology for specifying, estimating, and testing hypothesised interrelationships among variables in the behavioural and social sciences (Raykov et al., 1991). 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 (Mueller, 1996).

For relationships to be called causal, they require; covariation, i.e. the constructs vary together, temporal asymmetry, i.e. the constructs vary in sequence, and the elimination of other possible causes. The third requirement is impossible to achieve as it can never be proven that all other possible causes are removed. It is necessary, therefore, either to include them all or to proceed without them. Partial Least Squares (PLS) is a second-generation multi-variate analysis technique for SEM which performs factor analysis and regression analysis simultaneously (Thompson, *et al.* 1991). Figure 1 shows the results for the tests for hypotheses 7-13.

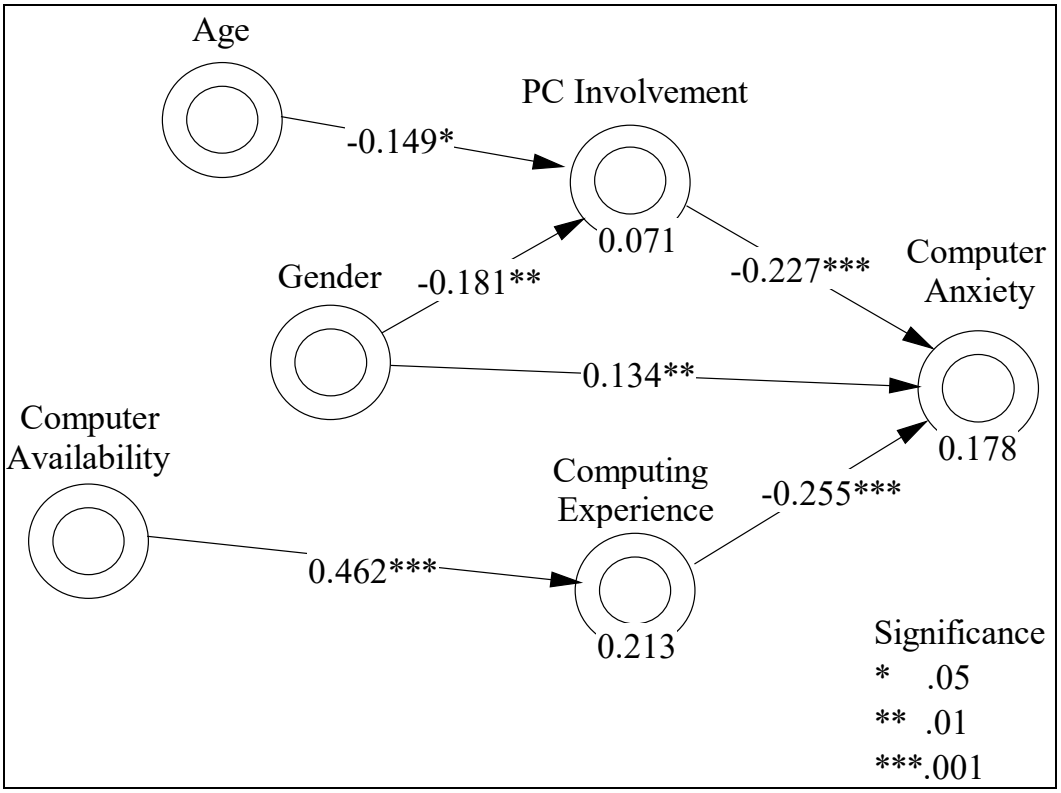

Figure 1. PLS Analysis for Hypotheses 7-13

The PLS analysis only shows paths which are both substantive (path coefficient >0.1) and significant. All paths shown are significant at p=.05 or better.

As PLS allows the researcher to re-specify the model after hypothesis testing, in order to test for additional relationships (Pulos and Rogness, 1995), it was decided to test for an influence from computer availability upon computing experience. A strong and significant relationship was discovered, suggesting that individuals in the study 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, but the effect of experience in alleviating anxiety suggests that making computers available offers a practical first step towards ultimately reducing users' fears about using them.

DISCUSSION

The results provide support for seven of the 16 hypotheses. Cultural background appears as a possible influence on both computer anxiety and PC involvement, as does gender, in support of hypotheses 1 to 4, 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 psychological dimensions. The Thai and Hong Kong groups were 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 induce involvement, thereby indirectly attenuating anxiety. The indirect influence of gender on computer anxiety is 0.041 (-0.181*-0.227), which increases its total influence to 0.175 (0.134+0.041). Although age did not have a significant influence on computer anxiety, there is a slight indirect influence (0.034) through PC involvement. 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 Tanzanian group, 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 (Igbaria, 1990). 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 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. The variable failed to differentiate between the subjects with regard to either their anxiety or their involvement. 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 which have not been identified. There was insufficient evidence to suggest that the older students were less anxious about computers than the younger students.

Computing experience did not appear to influence PC involvement, but it displayed a significant inverse relationship with computer anxiety, suggesting that students with more experience were less likely to exhibit anxiety about using computers. 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 on computer experience. The model explains 21.3% of the variation in computing experience, which is accounted for by the single variable of availability. Finally, PC involvement displayed an inverse and significant influence on computer anxiety, suggesting that higher levels of involvement alleviate anxiety about using computers.

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.

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 in development scenarios. Data was collected relating to a specific aspect of the behavioural components of computer use in order to illustrate one such difference. The descriptions of the political, economic and cultural backgrounds of the countries from which the study subjects were drawn demonstrate the differences between each of the contexts within which IS implementations take place. In attempting to illustrate a specific example of such differences, the study failed to find differences between the computer anxiety of different cultural groups which might be attributable to their culture, but revealed differences between the PC involvement of different cultural 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, and in this respect, it is probable that any type of computer use serves to alleviate computer anxiety, so that computer games and trivial applications can pave the way for more advanced uses by otherwise reluctant users.

Contrary to expectations, the study was unable to expose any differences in the levels of anxiety and involvement 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 has some weaknesses. Firstly, a sample of students may not be considered as representative of the user population and generalisations beyond the sample should be made with caution. Other subjects might present different results, for example, if they had not enjoyed the availability of computers which most university students now enjoy. Additionally, the results might have been interpreted with greater confidence had the sample been larger.

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 cultures become psychologically involved with PCs, which may inhibit their adoption. The study has identified influences from age and gender, but these factors only explain a small proportion of the variation in PC involvement. As there can be little control over them, it is necessary to identify other factors which are capable of inducing involvement, and which are attuned to the culture in which they are to be applied. Further research is required in order to identify factors that influence PC involvement, as well as finding culturally sensitive methods for inducing it.

The cultural, economic and political differences between the groups suggest that the context against which IS implementations take place differs widely from country to country. Moreover, the factors that may induce involvement create differences at several levels of analysis. Firstly they exist between the developed societies which create IT and the less-developed societies which use it. Secondly, such differences exist among the less-developed societies themselves. Thirdly, differences exist within both developed and less-developed societies between any culturally distinct groups which exist within them.

Accordingly, information systems in developing societies require two levels of adaptation. Firstly, any assumptions about how IT is to be used, which might have become embedded as a result of being developed within a particular society or culture, usually a developed one, need to be removed. Secondly, information systems needs to be adapted to the specific society or culture in which they are intended to be used, because developing countries vary greatly in terms of the social, political, and cultural factors which contribute to the success of IT. We argue that merely "de-culturalising" an IT solution for use in a development scenario denies the existence of enormous cultural variety among the developing societies and therefore risks its rejection if it is not "re-culturalised" for the society in which it is intended to be used.

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Appendix - 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 ?
2. 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 someway.
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.