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DO STUDENTS AND LECTURERS FEEL THE SAME ABOUT COMPUTERS?

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Abstract: Full integration of Information Technology into teaching and learning at universities requires high levels of involvement with the technology and greater commitment to making effective use of it from teaching staff as well as from their students. As lecturers progress from the use of IT for routine productivity gains to its introduction into core teaching activities, their students have to adjust to new modes of learning. To be successful, both lecturers and students should adapt their teaching and learning approaches to the use of IT in harmony with each other, otherwise the new methods which IT imply may fall short of their expectations. This study examined some of the attitudes which university lecturers and students in the same institution have towards computers. The results suggest that students are both more involved with and more anxious about computers than are their lecturers. As academic staff develop IT for instructional uses, they should not confuse their students' apparent enthusiasm for computers with a willingness to adopt IT as a learning tool. To use IT successfully in teaching and learning, an institution depends on the willingness of staff to adopt such measures as well as on their ability to win over their students to use them.

1. INTRODUCTION

Information Technology (IT) has demonstrated considerable potential for enhancing teaching and learning in universities. Massey and Zemsky (1995) note that most US institutions of higher education have made major investments in new technologies. They claim that the demand for IT-based teaching and learning programmes will grow substantially, and that IT will change teaching and learning profoundly.

Despite the widespread deployment of computers among university staff, evidence suggests that educational institutions are not achieving the full advantages which they might from their technology investments. Gilbert (1995) suggests that many lecturers are reluctant to move beyond word processing, and that institutions may have underestimated the difficulty of persuading lecturers to adopt IT. In a study at one university in the USA, Wilkins and Nantz (1995) discovered that teaching uses of the computer network were low and perceived future uses were also low. Meanwhile, Massey and Zemsky (1995) refer to the conservative tendencies of universities,

suggesting that optimising the use of IT requires lecturers to change what they clearly prefer to leave untouched.

On the other hand, we hear that school-children and students take to computers quite rapidly and that young people tend to be more positive about using computers than do older people (Igbaria and Nachman, 1990; Harrison and Rainer, 1992). In universities, students are increasingly being provided access to computers. In 1992, the British Inter-University Committee on Computing recommended that universities provide an average of one workstation for every four students by 1996, as well as providing cheap access to computers for students off campus (McDonough, 1992). At Hong Kong's newest university, the University of Science and Technology, all students are provided with computer network sockets in their halls of residence (Woo, 1988).

Massey and Zemsky's (1995) prescription for effective use of IT in higher education requires lecturers to modify teaching and learning processes. As students are joint participants in the teaching and learning process, they too will be required to modify the processes by which they learn. However, whilst the provision of technology is necessary, it is not a sufficient condition for successfully changing the methods used in higher education. Paré and Elam (1995) claim that despite the technological infusion which takes place in universities, the use of personal computers (PCs) is, for most lecturers, still wholly discretionary, as it is for most students who are not engaged directly in technology-related programmes. Nonetheless, social psychologists warn that in voluntary situations, behaviour is governed by attitudes (Ajzen and Fishbein, 1980). It is therefore necessary to assess the extent to which lecturers and students are in harmony with regard to their attitudes and behaviours in order that the modifications which both are to enact can proceed at an equal pace and with a high chance of success.

2. COMPUTERS AND BEHAVIOUR

The results of numerous studies have attested to the influence of users' beliefs and attitudes on their computer-related behaviour and many user-related factors have been identified, viz.:

- *computer anxiety*, (Igbaria and Nachman, 1990; Torkzadeh and Angulo, 1992),
- *motivation*, (Rockart and Flannery, 1983; Doll and Torkzadeh, 1989),
- *involvement*, (Doll and Torkzadeh, 1989; Barki and Hartwick, 1989),
- *social norms*, (Thompson, Higgins and Howell, 1991),
- *attitudes* (Melone, 1990; Igbaria and Nachman, 1990; Harrison and Rainer, 1992),
- *self-efficacy* (Torkzadeh and Koufteros, 1994; Compeau and Higgins, 1995).

When computer usage is voluntary, certain characteristics of the individual will either induce or inhibit such usage. These characteristics include: the anxiety that many people feel about using computers; the sense of psychological or physical involvement with the development of computer systems; the computer-related values, beliefs and behaviour of users' peers, colleagues and other close social contacts; and finally the extent to which users believe they will be able to acquire appropriate computer skills.

Where systems are used by groups of people, all members of the group should share the same feelings towards the system so that they will all use it to its fullest extent. If this is not the case, then some individuals will not gain the same benefits as others and the system will not achieve its full potential. As lecturing staff change to new methods of instruction and prepare technology-based teaching materials, they should know how their students feel about those new methods and about the technology.

3. COMPUTERS IN EDUCATION

Interactive educational technology can be used to: raise the quality of teaching; increase efficiency through lower-cost alternatives to conventional instruction; extend access beyond the space-time constraints of traditional campus life; and produce graduates with better adaptability to information-based technological environments. Gilbert (1996) has summarised the process of technology integration in universities into three stages: i) automation of common business administrative functions; ii) enhancement of current tasks; and iii) the changing of core functions.

In most universities, stage one is characterised by the development of payroll and other accounting functions. These adoptions are quick and relatively painless, and there is little impact on the core functions of the organisation. In stage two, individuals find IT applications which can easily be applied to important tasks, such as presentation software to replace overhead projectors. There is little impact on the core functions but small gains in instructional quality may occur. Stage three is characterised by a realisation that IT may enable new tasks to be performed. Higher education is now entering the third stage of technology integration, where institutions look to IT to facilitate better educational services, relieve the strain on resources and act as a catalyst for a fundamental rethink of the whole learning process (Gilbert, 1996). As Searl (1993) puts it, within higher education, IT is bringing into question the efficiency and necessity of traditional educational practices. There are many possible situations where IT could be used to change the core teaching and learning functions, viz.:

- Student use of email/web pages for assignment submission.
- Lecturer use of email/web pages for assignment commenting.
- The posting of information sources, syllabi and lecture notes online.
- Searching the Internet and evaluating sources.
- Use of presentation technology by students and lecturers alike.
- Interactive computer-assisted learning packages.
- Web-based multi-media courseware.
- Electronic Classrooms.

It is useful to describe one application of IT in education, the electronic classroom, since it exemplifies many of the components of the third stage of technology integration. Electronic classrooms combine computer-based multimedia lecture tools with audio-visual devices, and/or networked computers for each student. Their usage involves the use of computer presentation software, videotapes, software demonstrations and video visualizers to project images from books and newspapers. They refresh traditional lectures and open transformational windows to active individual learning and

collaborative learning by small groups and entire classes, according to Shneiderman et al. (1995). Student learning experiences have included; software use for composition in a foreign language, image database searching, business simulations, psychological statistical analyses, and landscape design. They also involved the use of groupware products to support brainstorming, business case studies and course evaluation questions. Within minutes all students obtain a sense of active engagement with the task in hand, and the anonymity of contributions reduces class domination by a few more vocal students, democratising participation among all involved (Shneiderman et al., 1995).

The electronic classroom example is used to demonstrate the extent to which IT can be used to modify educational processes. It also demonstrates that the level of involvement and commitment required for successful implementation of such processes is as high for the student as it is for the lecturer, as both are equal participants in the process and with their use of the technology.

Table 1 indicates the varying levels of involvement with IT which are required by lecturers and students as universities progress through the three stages of technology integration.

<i>Table 1. Stages of IT integration in universities</i>			
Stages of IT Integration		Level and need for individual involvement with IT	
<i>Stage</i>	<i>Description</i>	<i>Lecturers</i>	<i>Students</i>
1	Administrative automation	Very little, not necessary	None, not necessary
2	Teaching task enhancement	A lot, required	Little, some need
3	Change in core functions	Total, vital	Total, vital

It can be seen that the level of involvement which is required of lecturers steadily increases as their institution proceeds through the three stages, but that the level required by students takes a sudden leap as the institution approaches the third stage. Lecturers will therefore have had more time to become accustomed to the new methods of working, as well as more experience of computer use. Students, on the other hand, will be more likely to experience a sudden exposure to the use of computers, not just for their various support functions, but possibly for their core learning requirements which use quite sophisticated technology and methods. The operation of such systems, which is inferred by the achievement of stage three, should therefore be supported by some understanding of how well students will accept them and the extent to which their values and beliefs about computers match those of their lecturers.

4. THE STUDY

The objective of the study was to measure and contrast teaching staff and students in the same institution with regard to two psychological factors which are known to encourage or inhibit computer use - computer anxiety and product involvement. Both factors have been shown to influence the rate and extent to which individuals adopt computer systems.

4.1 Computer anxiety

Computer anxiety refers to the tendency of an individual to be uneasy, apprehensive, or fearful about the use of computers (Igbaria and Nachman, 1990). Computer anxiety has been identified as a key component of the behavioural responses of many users and potential users of computers (Igbaria and Nachman, 1990; Torkzadeh and Angulo, 1992; Harrison and Rainer, 1992). Computer anxiety has been shown to inhibit the rate at which users adopt computer systems. Torkzadeh and Angulo (1992) point out that computer anxiety is an important psychological construct because of its potential to help us discover both forward and backward links in a causal chain that are important to computer systems development, implementation and use. Thus computer anxiety is potentially both a dependent variable and an independent variable, and there is need for research efforts on both forward and backward links in this causal chain (Torkzadeh and Angulo, 1992). The instrument to measure computer anxiety is taken from Igbaria (1990) (see the Appendix for the scale items).

4.2 Product involvement

Product involvement is a marketing concept known to influence consumer behaviour in purchasing situations (Bloch, 1981; Richins and Bloch, 1986). Barki and Hartwick (1989) describe involvement as a subjective psychological state, reflecting the importance and personal relevance of something to an individual. PCs are suitable products for inducing product involvement in consumers (Richins and Bloch, 1986). Paré and Elam (1995) found computer-related activities, such as watching TV documentary programmes on computers, and consulting computer-oriented magazines, activities which are indicative of a psychological state of involvement, to be among the dominant predictors of PC usage. The involvement of users with the development of computer systems has long been recognized as an influence on the extent to which they adopt those systems (Barki and Hartwick, 1989). Consumer research has identified the PC as a potential class of consumer product that is likely to engender consumer involvement (Bloch, 1986). Similar concepts have been examined in Information Systems e.g., “lead users” who are the first to adopt new systems, (Pliskin, 1989) and “computer zealots” who actively seek computer-based solutions for tasks in preference to non computer-based solutions (Ray, Harris and Dye, 1994). Product involvement has been shown to be among the factors which influence the use of PCs by attenuating computer anxiety (Harris, 1997). Product involvement was measured using an adapted version of a scale developed by Bloch (1981) for measuring involvement with motor cars (see the Appendix for the scale items).

4.3 Subjects

The subjects were drawn from the City University of Hong Kong and data was obtained from 53 students and 50 teaching staff. Demographic data of the subjects is shown in

Table 2.

<i>Table 2. Demographic data of subjects</i>				
	Male	Female	Total	Mean Age
Academic Staff	37	13	50	41.7
	74.0%	26.0%	100.0%	
% within gender	82.2%	22.4%	48.5%	
Students	8	45	53	22.4
	15.1%	84.9%	100.0%	
% within gender	17.8%	77.6%	51.5%	
Total	45	58	103	31.7
% within gender	43.7%	56.3%	100.0%	

Partial Least Squares (PLS) was used to compare the product involvement and computer anxiety of each group of subjects and to model the inter-relationships between them. PLS is a second-generation multi-variate analysis technique introduced by Herman Wold to analyse data for which the theory is scarce (Bertholet and Wold, 1985). PLS produces loadings between items and constructs and provides standardised regression coefficients between constructs as well as the squared multiple correlation coefficients (R^2) for dependent constructs. The computer program PLS-Graph version 2.91.02.08 (November 1995) was used. This was developed by Dr. Wynne Chin at the University of Calgary. The software program runs on a PC under Windows and provides a graphical interface which allows the user to draw a structural equation model. The interface allows the user to examine the statistical output of the estimation process in conjunction with the diagrammatical representation of the model.

4.4 Results

Table 3 displays the mean values for the constructs of interest. Table 4 shows correlations between the variables. PLS was used to test the relationships between the variables, particularly to test whether subject type (lecturer or student), or the demographic variables depicted any causal relationship with the two psychological constructs of interest. The results appear in figure 1. The arrows depict the direction of the supposed relationship, with their path coefficients. Significant path coefficients of 0.10 and above are preferable (Compeau and Higgins, 1995). The squared multiple correlation coefficients (R^2) for each of the two psychological variables are shown and are used to assess the proportion of variance which is accounted for by their predictor constructs. They provide a measure of the predictive power of the model and should be >0.10 to be considered substantive (Falk and Miller, 1992).

		Computer Anxiety		Product Involvement	
		Mean	SD.	Mean	SD
Staff	Male	2.07	.71	3.32	.66
	Female	2.43	.69	2.96	.70
	Total	2.16	.72	3.22	.68
Students	Male	2.84	.73	3.63	.45
	Female	2.80	.53	3.39	.47
	Total	2.81	.56	3.43	.47
All	Male	2.21	.77	3.37	.63
	Female	2.72	.59	3.30	.55
	Total	2.49	.72	3.33	.59

Discriminant validity of the instruments can be measured in a PLS model by comparing the cross loadings of the items used to measure each construct. In the above model, none of the items measuring their respective construct loaded higher on the other construct. Measurement reliability of the scales is indicated by the value of Cronbach's alpha, which should be greater than 0.7, for acceptable scale reliability. The scale for product involvement achieved a reliability of 0.72, and that for computer anxiety achieved 0.85.

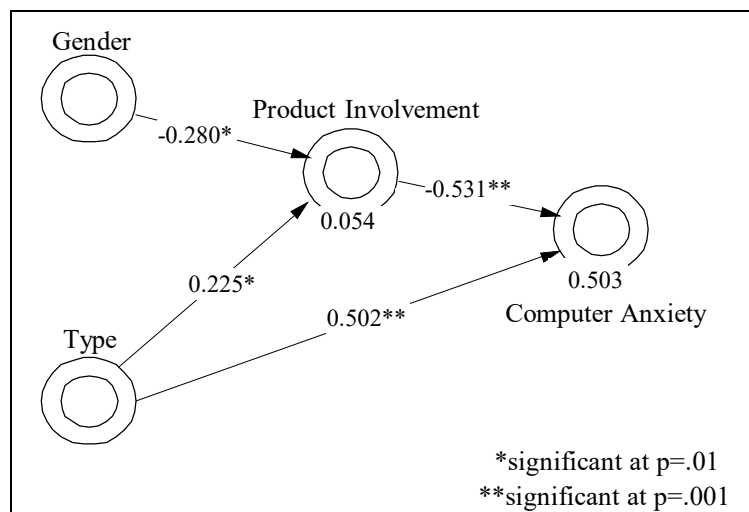


Figure 1. PLS model of the inter-relationships between the constructs.

Table 4. Correlations

	Type	Age	Gender	Product Involvement	Computer Anxiety
Type (1=teaching staff, 2=student)	1.00				
Age	-.77*	1.00			
Gender (1= male, 2= female)	.59**	-.48*	1.000		
Product Involvement	.18	-.17	-.06	1.000	
Computer Anxiety	.45**	-.28*	.36**	-.46**	1.000

** Correlation is significant at the 0.01 level (2-tailed).

5. DISCUSSION

From Table 3 it can be seen that the students in the study seemed to be slightly more involved with computers and slightly more anxious about them than the lecturers. Also, males were slightly more involved than females, who were in turn more anxious than the males. Overall, the male students scored higher than the other groups on both anxiety and involvement. Male lecturers scored the lowest on computer anxiety and their female counterparts scored the lowest on product involvement.

The model in Figure 1 suggests that the type of subject exerts a moderate but significant influence on product involvement and a strong and highly significant influence on computer anxiety. The polarisation of the instrument indicates that students are more likely than lecturers to be both involved with computers and anxious about them. Additionally, the strong, inverse and highly significant relationship between product involvement and computer anxiety suggests that those who are involved with computers are less likely to be anxious about them. Gender appears to exert a moderating effect on product involvement, as the strength and significance of the inverse relationship indicates that the females in the study are less involved with computers than men. The model explains a non-significant amount of the variance in product involvement (5%), but a large amount of the variance in computer anxiety (50.3%). It is therefore far more predictive overall of computer anxiety.

6. IMPLICATIONS AND CONCLUSIONS

The results suggest that students are both more involved with and more anxious about computers than are their lecturers. Computer anxiety has been shown to be an inhibitor of computer use and as it appears that inducing involvement provides a potent measure for reducing anxiety it thereby provides a means for increasing usage. Although the gender composition of the sample was not equal, it appears that the men in the study were more involved with computers than the women. Measures for inducing involvement should, therefore, be aimed initially at female users.

The results suggest that lecturers who adopt IT in their programmes should be aware that their students might have different feelings about the use of computers than they have. Whilst it would appear that students have already accepted that computers are important to campus life, they may not necessarily feel confident enough to make the most effective use of them within their learning activities. Lecturers would be advised, therefore, to reassure their students that IT-based learning programmes provide a legitimate means of advancing knowledge, comparable to attending classes and reading books. Furthermore, this should be demonstrated to them as an integral part of the programme.

Stage three of IT integration into universities affects every student. Acceptance of IT as a learning medium is now as fundamental as the acceptance of books, which is unquestioned. The adoption of IT in learning processes, however, is far less certain. Institutional responses vary greatly, and within institutions, individual teaching staff adopt such methods at widely varying rates. The potential exists for confusing students with regard to their own use of IT as a tool for learning. Whilst libraries usually provide stable and reliable methods for knowledge acquisition from books, similar support structures for the use of IT in knowledge acquisition are not generally available. Universities can adopt an institutional response to the opportunities offered by stage three, rather than leaving it to individuals to adopt IT-based methods at their own pace and discretion. The measures described above can be pro-actively implemented. For example: use of the World-Wide Web and e-mail can be mandated; classrooms can be fitted with network outlets, computers and projectors; multi-media courseware can be required as standard and electronic classrooms can be installed and used. We believe that initial attempts to involve students to a greater extent with IT should involve a lecturer *and* student mode, i.e. where both are directly participating. If this can be successfully achieved, steps towards technology that involves distributed settings and a higher level of student motivation may be undertaken. Whilst such measures can indicate that the use of IT becomes standard practice, further research would help to indicate the extent to which they, and any other methods, might induce involvement with IT within students.

As universities progress towards the third stage of IT integration and academic staff start to develop IT for instructional uses, lecturers should not confuse their students' apparent enthusiasm for computers with a willingness to adopt IT as a learning tool. An institution's successful progression towards the use of IT in teaching and learning will depend not only on the willingness of staff to adopt such measures but also on the extent to which their students can also be won over to accepting their use. This acceptance may be eased if the lecturers are seen to be involved with the students in the learning process they share.

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APPENDIX. Scale Items

Product Involvement

Please rate your agreement with the following statements on a scale of 1 to 5, where; 1 = Strongly disagree, 2 = Disagree somewhat, 3 = Neither agree nor disagree, 4 = Agree somewhat, and 5 = Strongly agree.

1. When I am with friends, we often talk about personal computers.
2. I regularly read magazines and newspaper articles about personal computers.
3. I am confident about understanding most of what I read or hear about personal computers.
4. I like to own a personal computer of my own.
5. I believe it is necessary to keep my knowledge about personal computing up to date.
6. I believe personal computers are important in today's world.

Computer Anxiety

Please rate your agreement with the following statements on a scale of 1 to 5, where; 1 = Strongly disagree, 2 = Disagree somewhat, 3 = Neither agree nor disagree, 4 = Agree somewhat, and 5 = Strongly agree.

1. I am not at all confident that I could learn personal computing skills.
2. I am unsure of my ability to learn a computer programming language.
3. I will not be able to keep up with important technological advances in personal computers.
4. I feel apprehensive about using a personal computer.
5. If given the opportunity to use a PC, I am afraid that I might damage it in some way.
6. I have avoided personal computers because they are unfamiliar to me.
7. I hesitate to use a personal computer for fear of making mistakes that I cannot correct.
8. I am unsure of my ability to interpret a computer printout.
9. I have difficulty understanding most technological matters.
10. Computer terminology sounds like confusing jargon to me.