International Journal of Arts and Sciences
3(14): 327 - 350 (2010)
CD-ROM. ISSN: 1944-6934

The Impact Of Technology On Job Characteristics And Internal Motivation: A Study Of Instructors In Institutions Of Higher Learning In Malaysia

Nurita Juhdi, Tun Abdul Razak University, Malaysia
Ahmad Zohdi Abd Hamid, Alhosn University, Abu Dhabi, UAE
Mohd Saeed Bin Siddiq, Tun Abdul Razak University, Malaysia

Abstract: Application of technology in education has gained impetus and offers exciting prospects and new challenges. Policy makers, educational institutions and corporate sectors are committed to realizing the potential benefits of technology. Nonetheless, given huge investments made in setting up technology-based educational environment, research indicates that instructors report mixed views on how the use of technology affects their jobs and work outcomes. Prior studies that examined technology impact on instructors and the multiple roles associated to teaching were conducted mainly using qualitative research method, and this necessitates a specific study that allows quantitative analysis. Specifically, the present study examines how technology influences instructors' teaching job and their internal motivation. Given the multiple roles that instructors have to perform, four major roles associated with teaching (pedagogical, managerial, technical and subject design) were examined. Data were collected using questionnaires that were distributed among instructors in public and private tertiary educational institutions in Malaysia. Questionnaires were sent using e-mails, regular mails and personal visits to potential respondents. Two hundred and ninety two respondents were finally generated. The findings indicated significant differences in technical role attributes among those using traditional, medium and pure e-learning technology. Another major finding was that technology levels have significant impact on internal motivation, after the managerial and technical role attributes make their individual contribution to the variance in internal motivation. This study has implications to theorists and practitioners. For theorists, it provides more empirical evidence for technology impacts on instructors' teaching role attributes and internal motivation. For policy makers, few major areas require close re-examination particularly instructors' teaching job design, training needs and performance evaluation.

Keywords: Technology, job attributes, instructors, internal motivation

Introduction

Higher educational institutions (HEIs) in Malaysia are committed to realizing the potential benefits of technology in teaching delivery. This is in line with the government's effort to implement the use of technology in all economic sectors with the intention to facilitate knowledge creation, building human capability and enhance

competencies. Most public universities in Malaysia had planned technology integration in teaching and learning way back in 2000 (Raja Maznah, 2004). Technology integration was initiated by the acquisition of sophisticated technology infrastructure. Private universities in Malaysia were also quick to respond to the government's call and this can be seen by the establishment of several private HEIs that offered courses online in the beginning of the new millennium.

Given the projected phenomenal transformation in education, ample studies and research have been conducted to assess the perceptions of technology in teaching delivery among students and instructors. The studies were also done to assess to what extent the use of technology has contributed to teaching and learning. Despite the optimistic projection of the use of technology in education, the study findings revealed mixed views and opinions among users (such as in Neo and Neo, 2009; Marlia, 2007; Latifah, Ramli, Zoraini Wati and Nik Azlina, 2004; Poon, Low and Yong, 2004). It should be noted that the same findings were also observed elsewhere in other parts of the globe (such as in Gratton-Lavoie and Stanley, 2009; Mitchell, 2009; Agbonlahor, 2006; Hacifazlioglu, Sacli and Yengin, 2005; Ryan, Carlton and Ali, 2004; Hanson, 2003; Kewell and Beeby, 2003). As such, more studies should be conducted focusing on the impact of technology on users.

In measuring the impact of technology on instructors' roles, one important premise is the ability to operationalize the roles using measurable constructs. The literature provides ample evidence identifying the distinct roles of instructors. The important roles discussed in the literature revolves around four major areas of pedagogy, management, technical matters and subject-design (Berge, 2008; Ryan, Carlton and Ali, 2004; Bennet and Lockyer, 2004; Jaffee, 2003; Barker, 2002; Goodyear, Salmon, Spector, Steeples and Tickner, 2001). All these roles prevail regardless of technology used, students' profile or learning environment nature. However, all these research findings were based on qualitative research and has never been empirically tested whether or not all the four roles are truly distinct from each other. In addition, there have not been any studies conducted to measure the complexity of each role. In this present study, in line with the objective to measure the distinct characteristics of each role, validated measurement instruments are used to operationalize all the four teacher roles.

Previous research undertaken to examine the impact of technology on the teacher's job reveals that teachers have different attitudes, perceptions and expectations (Mitchell, 2009; Marlia, 2007; Agbonlahor, 2006; Hacifazlioglu, Sacli and Yengin, 2005; Ryan, Carlton and Ali, 2004; Hanson, 2003; Kewell and Beeby, 2003). Many of these studies generate interesting findings that enrich the body of knowledge in the area of technology's influence on teachers' job attributes. However, the effort should not stop there as there is another concern that has to be addressed: what would be the impact of technology on their internal motivation? More importantly, as posited by many researchers, job attributes and complexity have a significant impact on motivation (De Varo, Li and Brookshire, 2007; Wegge, Van Dick, Fisher, Wecking and Moltzen, 2006;

Thakor and Joshi, 2005; Boonzaier, Ficker and Rust, 2001; Kelly, 1992; Hackman and Oldham, 1980).

Prior studies conducted to investigate the influence of teachers' job characteristics on motivation (such as Steele and Fullagar, 2009; Barnabe and Burns, 1994; Winter and Sarros, 2002) indicated positive relationships between job attributes and motivation. Those who perceive themselves as having high autonomy and job significance report high levels of motivation. Unfortunately, it was not indicated specifically in these studies what level of technology was used by the instructors and thus, questions remain as to what it would be like when instructors have to use technology in their teaching practices? Would they experience high job attributes and thus higher levels of motivation? This is another aspect that is worth examining.

In the education arena, the impact of technology usage on teaching and learning has been greatly researched and discussed. Generally, teachers are optimistic about the potential of new technology influencing their teaching practices and students' learning (Shen, Wang and Pan, 2008; Siragusa and Dixon, 2006; Ryan, Carlton and Ali, 2004). Teaching and learning using computers and the Internet have quickly become wide widespread in higher educational institutions.

As more institutions of higher learning are introducing new educational technology to support teaching, instructors in these institutions are very eager to apply these new tools in delivering subject-content and managing students' learning, but many are also wary of its effectiveness and the competencies required in adapting to the changes demanded by the new teaching-learning environment. Technology comes with different features and characteristics. Therefore, users should know how to effectively use it based on the functions, capabilities and limitations appropriate for the type of subject-content. More importantly, the adoption of technology in teaching may change the roles and responsibilities of teachers and in turn, may affect work outcomes such as job satisfaction, motivation levels and work effectiveness.

Objectives of the Study

The main objective of this study was to examine the extent technology has affected instructors' work characteristics and their internal motivation. The study was conducted among instructors teaching in HEIs. Specifically, the study is aimed to:

a. Examine differences in teaching roles attributes (namely, pedagogical, managerial, technical, and subject-design) among instructors that used different levels of teaching technology.

b. Determine the relationship between individual teaching role attributes (namely, pedagogical, managerial, technical and subject design) and instructors' internal motivation using different levels of technology.

International Journal of Arts and Sciences
3(14): 327 - 350 (2010)
CD-ROM. ISSN: 1944-6934

Literature Review

Job Characteristics

According to Hackman and Oldham (1980), there are five different job attributes that influence employee satisfaction and motivation; 1) *skill variety*; 2) *task identity*; 3) *task significance*; 4) *autonomy*; and 5) *feedback*. The authors proposed that the first three attributes contribute to the *overall meaningfulness of the job*. *Experienced meaningfulness* of a job is when a person feels that his job performance has a significant impact on the safety or well being of others. For instance, an instructor is expected to be able to facilitate class discussions, design course materials and use computer technology to perform his job. This would require various skills and new responsibilities that may influence his work outcomes.

An employee who is given more *autonomy* or freedom in how he wants to conduct a job will get the feeling of *experienced responsibility*. For example, someone who is responsible to decide important matters pertaining what tools or methods to use for his class and he is personally responsible for any failure or success of the learning activity. Finally, *feedback* from the job gives an employee the information of how good or bad he is performing. Such information provides the person with the *knowledge of the results*. These attributes are likely to influence the worker's job satisfaction and internal motivation. The more positive feelings and experience an employee derives from a job, the more satisfied and motivated he will be. It is thus expected that the person would continue the good performance and eventually the internal rewards would serve as incentives for continuing to do well in the future.

Use of Technology and Instructors' Role Attributes

There are four major roles teachers or university instructors have to carry out in performing their duties and responsibilities. These four roles are: pedagogical, managerial, technical and subject-designing (Bennet & Lockyer, 2004; McMann, 1994; Goodyear, Salmon, Spector, Steeles & Tickner, 2001; Bunker & Vardi, 2001; Harden & Crosby, 2000).

Pedagogical Role Attributes

Miller and King (2003) noted that the key to success in any course, whether technology-based or not, is the instructors' pedagogical skill. Being a teacher, the person is responsible to explain, provide reinforcement and support, make announcements, gives directions, discipline students and many others that are related to imparting to students what the teacher possesses. In the traditional environment, most instructions are given face-to-face. There are human contact and personal touch from the instructors. The presence of verbal communication such as intonation and nonverbal communication like body language help to enrich the conveyance of messages. A teacher can always use

different verbal and nonverbal communication style to express his or her opinion, to give remarks to students or even to encourage students to interact in the classroom. Such a luxury is absent in an online tutorial. Nonverbal communication like eye contact, gestures, facial expressions and other body languages are not visible to students. And most importantly, students are feeling isolated due to limited physical interaction. According to Newble and Cannon (1994), an instructor who uses the same approach in an online class will face difficulty as he has to find alternative ways to overcome the absence of nonverbal communication.

Managerial Role Attributes

According to Sadker and Sadker (1991), an effective teacher must also be a good manager who is able to organize the academic content and instruction. Educators are no longer focusing on controlling student behavior, instead they have moved to creating and maintaining an environment that supports learning (Evertson and Harris, 1992). Franklin (1988) and Hanson (1991) contend that teachers strongly feel that they are qualified to organize the learning process according to their own method. Despite the impersonal school rules that regulate the academic processes, once the teachers enter the classroom, the learning facilitation will accord their methods as they deem fit.

On the other hand, Flake, Kuhs, Donnelly and Ebert (1995) mentioned the importance of time management to an instructor. Time management is about setting the timeframe to plan, implement and evaluate the course. The need to manage time is even more important in e-learning as students are given the freedom to be independent and the amount of face-to-face meetings is rather limited. In order to keep students on track, a structured schedule indicating important activities such as online or face-to-face discussion, meetings and deadlines must be planned ahead and communicated to students. The fact that students are geographically dispersed makes managing the course even more challenging.

Major significant difference between traditional and e-learning in respect of class management is mainly contributed by the type of technology used to facilitate the learning processes and activities. In the traditional environment, when the physical interaction is there, the instructors can always communicate and remind the students on the activities of the course. But in e-learning environment, the instructors have to rely on various tools such as electronic bulletin board and email to communicate messages to students about new activities, feedback on students' work, changes and latest update.

Technical Role Attributes

Given the various techniques and media, instructors need to choose the one that is most appropriate depending on the learning outcomes, practicality and the costs to develop or to use the method. Being the one who determines which technology or tools to be used in the classroom, the instructor should be able to assist and guide the students in using the

equipment in such a way that facilitate learning. Inability to provide necessary assistance will lead to frustration among students. Everett (1998) points out that students' motivation to learn partly depends on their ability to persevere with technical problems and how these problems are resolved. Goodyear et al (2001) assert that instructors should have adequate technical skills and understand the capabilities and limitations of available technologies and tools.

In e-learning, Barker (2002) mentioned that online instructors should have the ability to use a range of different tools such as email, word processor, spreadsheet, database and Web page authoring tools. Bennet and Lockyer (2004) added that online instructors should develop skills to create and integrate electronic subject resources. Miller and King (2003) stressed that the instructor should be competent in using the technology so that he can decrease students' anxiety during the course and address technology issues that might arise.

Subject Designer Role Attributes

Jaffee (2003) who wrote on the transformation of pedagogical style from traditional environment to Web-based approach noted that in the former environment, the instructor will play as the 'sage on the stage' whose task is to actively deliver and the students to passively receive the information. Student-centered learning however, requires the students to be actively involved and be given the opportunity to apply their own understanding about the subject in order to come up with new ideas or knowledge. Under this environment, the course design should allow interactivity, collaboration and reflection. It also requires the instructor to rethink the course outcomes, content, assignments, supporting materials and evaluation methods. Bennet and Lockyer (2004) stated that the designer role of instructors in both settings; traditional and online, is basically the same. Instructors need to develop the overall design, identify assessment tasks and plan a sequence of activities and specific resources. In online settings, the instructors are expected to do more in order to make use of technology by integrating it in their designer roles to enhance learning. Here, the ability of instructors to design the course in such a way that creates learning and the same time utilizing the available resources is crucial.

Job Characteristics and Internal Motivation

The significant influence of instructors' job attributes on their internal motivation has been established in the literature (Steele and Fullagar, 2009; Barnabe and Burns, 1994; Winter and Sarros, 2002). Numerous studies done in other industry settings also find consistent results that clearly indicate higher job attributes are able to boost motivation, satisfaction and performance (DeVaro et al., 2007; Wegge et al., 2006; Lee-Ross, 2005; Delle Fave and Massimini, 2003; McKeachie, 1997). Clegg and Spencer (2007) explain that as jobs get more demanding and difficult, employees normally would exert more

efforts to learn and adapt to the new situation and this may result in positive work outcomes.

It is noted by many researchers (e.g. Berge, 2008; Mason, 1991; Barker, 2002; Goodyear et al. 2001; Kerr, 1986; Sammons, 1990; Zafeiriou, 2000) that the use of technology in teaching influences the types of skills and tasks performed by the instructors. This makes the job of the instructors more challenging and complex. Ample evidence found in previous studies indicated instructors' positive and negative comments regarding the impacts of technology on their work (Mitchell, 2009; Shen et al., 2008; Marlia, 2007; Siragusa and Dixon, 2006; Poon et al., 2004). These studies revealed how an instructors' job is becoming more intricate and challenging with the impact of technology used in their daily work routine. It is noted in previous studies that more challenging jobs may result in higher internal motivation. Therefore, it is speculated that instructors who used higher level of technology in their teaching would experience higher degree of job attributes and thus are more internally motivated.

RESEARCH METHODOLOGY

Samples and Data Collection

All public and private institutions of higher learning in Malaysia were identified and samples were drawn from faculties/department of interest. In each faculty, lecturers were chosen using simple random sampling. As this study was about teaching roles and responsibilities, only those academic staff or faculty members who have a teaching load of at least 50 percent of their total work load were included in the study.

Questionnaires were distributed through online, regular mail and personal visits. Online survey yielded the lowest response rate (only 80 online responses) and thus regular mail survey had to be employed. This method generated 137 responses. The subsequent method used was to personally distribute the questionnaire and this technique resulted in 75 responses. In total, 292 responses were collected and it took about 6 months to complete.

Measurement Instruments and Statistical Techniques

Prior studies examining the influence of technology on the roles of instructor mainly used qualitative research method. This study chose to employ a quantitative approach which could provide empirical evidence about technology influence. In this study, the levels of technology was operationalized using several sources such as Gavin (2003), Fallon and Brown (2003) and, Roberts and Jones (2000). These scholars suggested several levels of e-learning technology ranging from the lowest to the most sophisticated technology. In this study, we added a new level that indicates a stage of learning that uses traditional method with minimum or no technology application. This traditional stage of learning

precedes the lowest e-learning method. Table 1 below describes the five levels of technology used in teaching.

Table 1: Measuring the Level of Technology Use among Instructors

Independent Variable: Level of Technology	**Descriptions:** In performing my role as a teaching instructor…
Traditional	… I use **no** / **very minimal computer applications** or other related technology. We use face-to-face meetings and teaching aids used are like white/blackboard, overhead projector, and printed handouts/documents.
Low technology	…sometimes I use word processing, power point presentation and Internet. I only use **face-to-face** meetings and **asynchronous** communication channels. I **do not use synchronous** communication channels at all.
Medium technology	…I use word processing, power point presentation and Internet. I **use both synchronous** and **asynchronous** communication channels. Learning materials are available to students at our institution's website and also in digital forms. **Face-to-face** meetings are still **extensively** used.
High technology	…I use word processing, power point presentation and Internet. I **use both synchronous** and **asynchronous** communication channels. Learning materials are available to students at our institution's website and also in digital forms. **Face-to-face** meetings are conducted **only** when necessary.
Pure e-learning	…I **only** use **synchronous** and **asynchronous** communication channels. Students are learning independently. Learning materials are available to students at our institution's website and also in digital forms. There is no **face-to-face meeting at all.**

Sources: Adapted from: (1) Fallon, C. and Brown, S. (2003) E-Learning Standards: A Guide to Purchasing, Developing, and Deploying Standards Conformant E-Learning, St. Lucie Press: Florida. (2) Gavin, T. (2003) "Industry Report", Training, 21 – 45. (3) Roberts, T. S. and Jones, D. T. (2000) "Crossroads of the New Millennium: Four Models of Online Teaching," TEND 2000 in Proceedings of the Technological Education and National Development Conference on the April 8-10, Abu Dhabi, UAE.

The instrument used to measure instructors' teaching job in the study was adopted from the Job Diagnostic Survey (JDS) developed by Hackman and Oldham (1980). There are 15 items (3 items to measure each of the 5 dimensions – skill variety, task significance, task identity, autonomy and feedback from the job) that are used to measure each teaching role attributes (pedagogical, managerial, technical and subject designing) and 6 items to measure internal motivation. All the items are expressed on 7-point scales, where 1 is low and 7 is high. Brief explanations on each of the four teaching role attributes were provided to ensure respondents understood the survey objectives and to make it clear to the potential respondents that they were required to evaluate the teaching role attributes individually across the 15 items. The last section of the questionnaire asked for the demographic information of the respondents.

Statistical Package for the Social Sciences (SPSS) 15.0 for Windows was used to analyze the data. One-way ANOVA test and multiple linear regressions were used to examine the relationships between variables.

DATA ANALYSIS

Respondents' Demographic Analysis

A total of 292 university instructors participated in the study. The majority of the respondents were from public universities (48.6%), 28.1% were from private university colleges, 22.6% from private universities and the rest (0.7%) were from public university colleges. In terms of teaching experience, 29% of the instructors had more than 11 years, 36.3% have between 6 to 10 years and 34.6% have 1 to 5 years. Out of the 292 respondents, 176 of them (60.3%) possessed Master degree, 19.9% with doctorate, and 19.2% with bachelor degree. Majority of the respondents were from the age group of 30 to 39 years old (52.4%), 21.2% in age group of 40 to 49 years, 19.5% were between 20 to 29 years old and only 6.8% were those above 50 years of age.

Factor Analysis and Reliability Tests

The factor analysis output on the sixty items that measured instructors' four teaching role attributes resulted in 11 factors, which explained 71.21% of the total variance. The Bartlett test of sphericity is significant and that the Kaiser-Meyer-Olkin measure of sampling adequacy is 0.917 which was far greater than 0.6. Inspection of the anti-image correlation matrix revealed that all the measures of sampling adequacy were well above the acceptable level of 0.5. In selecting items for each scale, two criteria were used. Firstly, items on a single factor with factor loading of 0.3 or less were dropped (Hair et al, 1998), and secondly, to improve scale reliability, items with less than 0.3 item-to-total correlations were deleted from the scales (Nunnally, 1978).

The factor analysis output indicated unclear cut factor loadings and the items did not appropriately loaded in the expected groups. Several factors were found containing items from different teaching roles. Nevertheless, for the sake of the present study, regardless of the dimensionality, four factors with items which indicate common teaching role were used and seven others were dropped as they did not provide meaningful interpretation. Despite the high loadings and since all the items within the respective factors did not appropriately loaded in the expected group, all these factors had to be dropped from further analyses. Subsequently, reliability tests were conducted to measure the Cronbach's coefficient alpha for each factor items. Factor 1 consisted of 10 items was labeled *subject design role attributes* with Cronbach's coefficient alpha of 0.936. Factor 2 that contained 8 items was named *pedagogical role attributes* and the reliability coefficient for the scale was 0.907. Factor 3 was labeled *technical role attributes* had 6 items with Cronbach's coefficient of 0.885. Factor 5 consisted of 8 items with reliability coefficient of 0.894 was labeled *managerial role attributes*.

Internal motivation construct was measured using the items in JDS that contain 6 items. Previous studies using these items measuring internal motivation indicate coefficient alpha ranged from 0.55 to 0.92 (for example Munz et al, 1996; Adkins, 1995; Mannheim et al, 1997; Mathieu et al, 1993). Reliability test conducted in the present study indicated coefficient alpha of 0.912.

Analysis of Variance across Different Technology Levels

One-way ANOVA tests were used to determine if there exist significant differences of role attributes in terms of technology used by the respondents. Based on the output in Table 2, significant difference was only found in *technical role attributes* across the five levels of technology (F=4.289, p=0.002). It could be concluded that technology level used by instructor exerted an influence on the *technical role attributes* for at least 2 of the 5 technology levels. However, the effects of technology level on *pedagogical role attributes, managerial role attributes,* and *subject design role attributes* were found to be insignificant.

A post hoc multiple comparisons was carried out to examine which level of technology significantly influenced *technical role attributes.* The results of the Tukey's test indicated that *traditional* users had significantly different *technical role attributes* means with *medium technology* users (mean difference of -0.52511, p=0.014). Tukey's test also showed a significant difference between *traditional* level and *pure e-learning* users (mean difference of -1.47348, p=0.022). There were no significant differences in *technical role attributes* between *traditional* and *low technology* users as well as between *traditional* and *high technology* users. Table 4.6 details the result.

Table 2: Analysis of Variance of Instructors' Roles Attributes Across Five Levels of Technology

		Sum of Squares	df	Mean Square	F	Sig.
Pedagogical role attributes	Between Groups	5.432	4	1.358	2.024	.091
	Within Groups	192.517	287	.671		
	Total	197.949	291			
Managerial role attributes	Between Groups	5.191	4	1.298	2.175	.072
	Within Groups	171.248	287	.597		
	Total	176.439	291			
Technical role attributes	Between Groups	14.813	4	3.703	4.289	.002
	Within Groups	247.791	287	.863		
	Total	262.605	291			
Subject design role attributes	Between Groups	5.045	4	1.261	1.309	.267
	Within Groups	276.616	287	.964		
	Total	281.662	291			

Technology Level, Pedagogical Role Attributes and Internal Motivation

Table 3 below shows the results of the regression analysis. As shown in Model 1, *pedagogical role attributes*, on its own, contributed 30.6 percent of the variance in internal motivation and was a significant predictor. In the second step of the MLR, the R-Squared statistics slightly increased to 31.1 percent and the F-value changed by 0.135 indicating insignificant difference between the two R Squares. Hence, adding technology levels variable into the model did not have any significant impact on R- Squared.

As indicated in Model 1, the standardized beta coefficient for *pedagogical role attributes* was positively significant (t=11.303, p=0.000). However in Model 2 (adding *technology levels* to the model), the beta coefficient of *technology levels* was insignificant (t=-1.499, p=0.135). Based on these results, Hypothesis 3a was partly supported with only *pedagogical role attributes* that had positive influence on *internal motivation*.

Table 3: Regression Results for Internal Motivation (N=292)

Model	Independent Variable	Beta	T	Sig.	Collinearity Statistics	
					Tolerance	VIF
1	(Constant)	2.530	8.538	.000		
	Pedagogical role attributes	.553*	11.303	.000	1.000	1.000
2	(Constant)	2.705	8.510	.000		
	Pedagogical role attributes	.553*	11.324	.000	1.000	1.000
	Technology level	-.073	-1.499	.135	1.000	1.000

Model 1: R Square: 0.306; Std. Error of the Estimate: 0.73287; F value: 127.767; F change: 0.000; *significant at p=0.05
Model 2: R Square: 0.311; Std. Error of the Estimate: 0.73130; F value: 65.282; F change: 0.135; * significant at p=0.05

Technology Level, Managerial Role Attributes and Internal Motivation

Table 4 below shows the results of the MLR analysis. Model 1 indicated *managerial role attributes*, on its own, contributed 25.4 percent of the variance in *internal motivation* (F=0.00). In the second model, R-Squared statistics increased to 27.3 percent with a Significant F Change value of 0.007 indicating a significant difference between the two R-Squared. Thus, adding the *technology levels* variable into the model provided a better explanation of the variance in *internal motivation* when compared to *managerial role attributes* alone.

As shown in the table, the beta coefficient of *managerial motivation* was found to have a significant positive relationship with internal motivation (t=10.299, p=0.000). However, the beta coefficient of *technology levels* has a significant inverse relationship with internal motivation (t=-2.727, p=0.007). The proportion of explained variance as measured by R-Squared for the above regression was 27.3 percent. Based on these results, Hypothesis 4a was fully supported with both *managerial role attributes* and *technology level* significantly influencing the internal motivation. The hypothesized significant influence of *technology level* on internal motivation was supported when adding *technology levels* variable into the regression equation did give significant increased in the R-squared.

Table 4: Regression Results for Internal Motivation (N=292)

Model	Independent Variable	Beta	T	Sig.	Collinearity Statistics	
					Tolerance	VIF
1	(Constant)	2.707	8.486	.000		
	Managerial role attributes	.504*	9.932	.000	1.000	1.000
2	(Constant)	2.930	8.990	.000		
	Managerial role attributes	.521*	10.299	.000	.985	1.000
	Technology level	-.138*	-2.727	.007	.985	1.000

Model 1: R Square: 0.245; Std. Error of the Estimate: 0.75983; F value: 98.647; F change: 0.000; * significant at p=0.05
Model 2: R Square:0.273; Std. Error of the Estimate: 0.75154; F value: 54.137; F change: 0.007*; * significant at p=0.05

Technology Level, Technical Role Attributes and Internal Motivation

As shown in Model 1 (table 5), *technical role attributes*, on its own, contributed 16.5 percent of the variance in internal motivation, and in Model 2, the R-Squared statistics increased to 19.3 percent with a Significant F Change value of 0.002 indicating that there was a significant difference between the two R-Squared. Thus, adding *technology level* variable into the model provided significant impact in increasing the R-Squared.

In Model 2, the beta coefficients of *technical role attributes* were significant and positive (t=8.191, p = 0.000), and *technology level* was also significant but had an inverse relationship with *internal motivation* (t=-3.140, p=0.002). The proportion of explained variance, as measured by R-Squared for the above regression, was 19.3 percent. Based on the results, Hypothesis 5a was fully supported with both *technical role attributes* and *technology level* significantly influencing internal motivation. The hypothesized significant influence of *technology level* on internal motivation was supported when adding technology levels variable into the regression equation it did significantly increase the R-squared.

Table 5: Regression Results for Internal Motivation (N=292)

Model	Independent Variable	Beta	T	Sig.	Collinearity Statistics	
					Tolerance	VIF
1	(Constant)	3.812	14.007	.000		
	Technical role attributes	.407*	7.580	.000	1.000	1.000
2	(Constant)	4.033	14.551	.000		
	Technical role attributes	.443*	8.191	.000	.954	1.049
	Technology level	-.170*	-3.140	.002	.954	1.049

Model 1: R Square: 0.165; Std. Error of the Estimate: 0.80360; F value: 57.462; F change: 0.000; * significant at p=0.05
Model 2: R Square:0.193; Std. Error of the Estimate: 0.79160; F value: 34.540; F change: 0.002*; * significant at p=0.05

Technology Level, Subject Design Role Attributes and Internal Motivation

As shown in Table 6, *subject design role attributes*, on its own, contributed 34.3 percent of the variance in internal motivation. In Model 2, the R-Squared statistics increased slightly to 34.4 percent and the change in Significant F was not significant. Thus, adding the *technology level* variable into the model did not contribute significantly to explaining the variation in *internal motivation.*

The beta coefficient for *subject design role attributes* was significant and positive (t=12.213, p=0.000) while for *technology level* its beta coefficient was not significant (t=-0.810, p=0.418). Based on these results, Hypothesis 6a was partly supported with only *subject design motivation* having a significant and positive influence on internal motivation. The expected influence of *technology level* on internal motivation was not supported and adding the variable into the regression equation did not result in significant increases in R-Squared.

Table 6: Regression Results for Internal Motivation (N=292)

Model	Independent Variable	Beta	T	Sig.	Collinearity Statistics	
					Tolerance	VIF
1	(Constant)	2.959	12.411	.000		
	Subject design role attributes	.585*	12.293	.000	1.000	1.000
2	(Constant)	3.062	11.317	.000		
	Subject design role attributes	.583*	12.213	.000	.996	1.004
	Technology level	-.039	-.810	.418	.996	1.004

Model 1: R Square: 0.343; Std. Error of the Estimate: 0. 71321; F value: 151.119; F change: 0.000; * significant at p=0.05
Model 2: R Square:0.344; Std. Error of the Estimate: 0. 71363; F value: 75.798; F change: 0.418; * significant at p=0.05

International Journal of Arts and Sciences
3(14): 327 - 350 (2010)
CD-ROM. ISSN: 1944-6934

DISCUSSION OF FINDINGS

The study's findings generally did not support the notion that there exist differences in terms of teaching role attributes across different technology levels used by instructors. The teaching role attributes in *pedagogical, managerial and subject-design role* did not indicate any significant differences despite the diverse levels of technology applied. The findings were inconsistent with the ideas proposed by most scholars that asserted that these three roles should differ significantly in terms of their degree of characteristics (Newble and Cannon, 1994; Mason, 1991; Kerr, 1986, Goodyear et al., 2001). However, significant differences were found in different technology levels in terms of *technical role* attributes. The significant difference captured in this study conformed to the views of the majority of scholars (Bennet and Lockyer, 2004; Goodyear et al., 2001; Miller and King, 2003; Kerr, 1986; Davie and Palmer, 1985). Further findings indicated that users of traditional technology for teaching were significantly different from those in medium and pure e-learning technologies. The former group of users was found to have relatively lower scores of *technical* attributes. Thus, it could be inferred that the higher the level of technology used in teaching, the higher would be the degree of characteristics in the *technical* aspect.

The insignificant findings in the other three teaching role attributes across the 5 levels of technology revealed an interesting point. Despite the diverse technology used in their teaching practices, instructors do not differ much in terms of their pedagogical, managerial and subject design role attributes. This may be due to the fact that in most Malaysian HEIs which are committed to adopting various technologies in teaching and learning, the major emphasis is only to ensure that they have the systems that enable information gathering, management, access, and communication in various forms. The other crucial aspects like upgrading ICT knowledge and skills as well as redesigning the instructors' jobs are neglected. With less emphasis in those aspects, the instructors fail to acknowledge the fact that there are significant differences between the traditional teaching method and the technology-based methods. Technology adoption by educational institutions was possibly done without proper assessment on the needs and readiness of the instructors. Instructors may have low awareness in their changing roles and thus resulting in the old ways of doing things despite the use of technology in their teaching.

In general, it was observed that all the four teaching role attributes indicated positive significant influence on internal motivation. This finding was in line with the views of major scholars who posited that the higher the degree of the role attributes, the more that the employees would be internally motivated (Wegge et al., 2006; Lee-Ross, 2005; Rosser, 2005; Iiacqua and Schumacher, 1995; Delle Fave and Massimini., 2003; Dinham and Scott, 1996; Kim and Loadman, 1994; Ostroff, 1992; Hackman and Oldham, 1980).

Another finding worth mentioning is that technology levels have significant negative influence on internal motivation which is consistent with the results in previous studies

(Kraft, 1977; Shaiken, 1984; Zimbalist, 1979; Braverman, 1974; Brod, 1984). The higher the level of technology used, the lower the internal motivation.

Referring to tables 4 and 5, adding *technology level* variable into the models provided significant impact in increasing the R-Squared and it should also be noted that technology was negatively affecting internal motivation. The results suggested that managerial and technical role attributes by themselves significantly explained the variance in internal motivation and likewise was observed when technology was added as an additional element in the job.

On the other hand, tables 3 and 6 indicated that adding technology factor into the regression equations did not significantly increase the R-squared. This implies that the role of technology was insignificant in its ability to explain the variance in internal motivation after the two roles (pedagogical role attributes and subject design role attributes) contributed their shares to the equation. As explained earlier, this could be due to three possible factors, namely lack of training, no systematic change in job design and lack of reinforcement to change the instructors' way of teaching.

MAJOR LIMITATIONS OF THE STUDY

There are several major limitations that have to be highlighted, which could be used as a guide for future research in this area. First, data collection for the study was conducted using the cross-sectional method. The data was gathered at one time resulting in a snapshot that may not reflect the evolution from traditional based to technology-based teaching methods in the higher educational institutions. If the data were collected using the longitudinal method, careful study of the changes from traditional to technology-based methods could have been done.

Second, the study should have been conducted using mixed method that employed both quantitative and qualitative approaches. Furthermore, given the large number of insignificant results, findings from qualitative research method could be used to elucidate the unclear relationships. Focus groups or in-depth interviews could have been used to clarify the grey area that is difficult to comprehend.

Third, most tests conducted in the study were not significant. This could be due to several reasons. The technology variable was measured using a single-item instrument that only qualified itself as an ordinal data. Future research could measure the technology variable using a score or index that includes more than one measurement items. Using a score or index may be more suitable that permitted the use of parametric statistical tools.

Fourth, results from multiple linear regressions yielded R-squared values less than 40 percent. This indicated that the role attributes and technology factor could only explain less than 40 percent of the variance in internal motivation and there could be other factors that influenced it. One possible reason was the items used to measure all these variables.

The present study employed the instruments developed by Hackman and Oldham (1975, 1980) and prior studies that used the same items were conducted in the Western countries. Using such instruments without considering the unique characteristics (like culture, values, way of life, mentality and perception) of the respondents could influence their validity. Hence, future research using the same instruments must make the effort to modify them so that the unique characteristics of the respondents could be captured. It is also recommended to include the unique variables into the conceptual framework.

THEORETICAL IMPLICATIONS

The research contributes to instructors' teaching job literature by identifying and measuring the major roles of instructors, particularly their roles in teaching aspects which have been widely discussed and studied. Given the fact that all the writings in the literature on teachers' roles which have been based on qualitative research method, the present study steps forward by examining and measuring all these roles using instruments that allow the measurement of their attributes. Using the Job Diagnostic Survey instrument developed by Hackman and Oldham (1980) allows more sophisticated analysis in assessing the distinct attributes of each role. The findings show that all the four roles are influenced by technology in different directions and to differing degrees. It was indicated that technology has significant positive influence on managerial and technical roles. By contrast, technology has negative (though insignificant) effects on pedagogical and subject-design roles. Such findings give some clues about which components of instructors' jobs require close re-examination and evaluation for the purpose of redesigning instructors' jobs to utilize technology at various level of sophistication. Should the study examine the whole instructors' job, the distinct impact of technology on the various roles could have been overlooked.

The impact of technology on employees' internal motivation has been the major focus of prior studies. The study findings that showed technology being the significant variable in enhancing the prediction of internal motivation provided an indication that the technology factor cannot be underestimated, more importantly, when technology was found to give negative impacts to internal motivation. Since many studies reflect instructors' mixed perceptions and feelings on technology influence (Bocchi et al., 2004; Poon et al., 2004; Marlia, 2007), the findings contribute to the literature on technology influence on instructors' internal motivation by clearing up doubts about its real impact.

Implications for Policy Makers in Higher Learning Institutions

The results of this study may not depict the whole phenomenon but still deserve the attention of policy-makers in higher educational institutions. Based on the outcomes, there are three key aspects that should be looked into: 1) lack of knowledge and skills among instructors to use higher technology in teaching; 2) attention directed towards reexamining the instructors' jobs that involve higher technology use; and 3) unclear links between the changing nature of teaching job and performance evaluation schemes.

Using higher technology for teaching is not only about getting the instructors to master the technology, because being "technology competent" is different from knowing how to use it. This explains the study finding that indicated higher technical attributes amongst instructors who use higher technology but in terms of pedagogical and subject design aspects, there were no significant changes observed. More focus should be given to teaching the instructors how to perform their pedagogical role when it involves the use of more complex technology. Instructors have to be skillful in adapting themselves to the changing environment that has shifted from teacher-centeredness to student-centeredness. They have to re-look into their pedagogical role not only because of the higher technology used, but also due to the changing expectations and profiles of the students.

Re-examination of job designs has been argued as one of the key issues to be addressed when new technology is implemented. New technologies demand that employees develop new skills and perform new tasks. Their existing tasks may also change. Unfortunately, evidence from prior studies revealed that organizations often failed to make necessary adaptations indicated by new technology.

Subsequently, with the redesign of the instructors' teaching job, performance management should also be revised. Institutions that adopt the new technology may set certain goals and targets that generally linked to their ability to achieve effectiveness and efficiency. Basically, the objective to use new technology is to facilitate teaching and learning that eventually results in knowledge and technology transfer. To realize this objective, institutions have to integrate training, work standards and performance evaluation. Work standards should be clearly identified by referring to the instructors' job descriptions or those could potentially require revisions. Various sources should be used to elicit feedback on the instructors' teaching performance such as from students, technical staff, administrative staff, and superiors as well as from the instructors themselves. They are all stakeholders who should be consulted in order to measure instructors' work performance.

REFERENCES

Adkins, C.L. (1995). Previous Work Experience and Organizational Socialization: A Longitudinal Examination. *Academy of Management Journal*, 38(3), 839-863.

Agbonlahor, R.O. (2006). Motivation for use of information technology by university faculty: A developing country perspective. *Information Development*, 22(4), 263-277.

Barker, P. (2002). Skill sets for online teaching. In *ED MEDIA 2002 World Conference on Educational Multimedia, Hypermedia & Telecommunications Proceedings*, Denver.

Barnabe, C. & Burns, M. (1994.) Teachers' job characteristics and motivation. *Educational Research*, 36(2), 171-185.

Bennet, R. (2002). Lecturers' attitudes towards new teaching methods. *International Journal of Management Education*, 2(1), 42-58.

Bennet, S. & Lockyer, L. (2004). Becoming an online teacher: Adapting to a changed environment for teaching and learning in higher education. *Educational Media International*, 41(3), 231-244.

Berge, Z. L. (1995). Facilitating computer conferencing: Recommendations from the field. *Educational Technology*, 35(1), 22-30.

Berge, Z.L. (2008). Changing instructor's roles in virtual worlds. *The Quarterly Review of Distance Education*, 9(4), 407-414.

Bocchi, J., Eastman, J. & Swift, C. (2004). Retaining the online learner: A profile of students in an online MBA programs and implications for teaching them. *Journal of Education for Business*, 79 (4), pp. 245-253.

Boonzaier, B. & Boonzaier, M. (1994). The job diagnostic survey: A functional tool for South African managers. *South African Journal of Business Management*, 25(3), pp.101-109.

Boonzaier, B., Ficker, B. & Rust, B. (2001). A review of research on the Job Characteristics Model and the attendant Job Diagnostic Survey. *South African Journal of Business Management*, 32(1), p.11-34.

Braverman, H. (1974). *Labor and monopoly capital*, New York: Monthly Review Press.

Brod, C. (1984). *Technostress: The Human Cost of the Computer Revolution*. Reading, MA: Addison Wesley.

Bunker, A. & Vardi, I. (2001). Why use the online environment with face-to-face students? Insights from early adopters. *Meeting at the Crossroads*, 111-116. Retrieved May 11, 2007, from http://www.ascilite.org.au/conferences/melbourne01/pdf/papers/bunkera.pdf

Clegg, C. & Spencer, C. (2007). A circular and dynamic model of the process of job design. *Journal of Occupational and Organizational Psychology*, 80, 321-339.

Davie, L. & Palmer, P. (1985). Computer-teleconferencing for advanced distance education. *Canadian Journal of University Continuing Education*, 11(2), 56-66.

Delle Fave, A. & Massimini, F. (2003). Optimal experience in work and leisure among teachers and physicians: Individual and bio-cultural implications. *Leisure Studies*, 22, 323-342.

DeVaro, J., Li, R. & Brookshire, D. (2007). Analysing the job characteristics model: New support from a cross-section of establishments. *International Journal of Human Resource Management*, 18(6), 986-1003.

Dinham, S. & Scott, C. (1996). Teacher satisfaction, motivation and health: Phase one of the teacher 2000 project" (ERIC Document Reproduction Service No. ED 405295)

Everett, D. R. (1998). Taking instruction online: The art of delivery. *Proceedings of SITE 98: Society for Information Technology and Teacher Education International Conference*, Washington, DC, March 10-14, 1998.

Evertson, C. M. & Harris, A. H. (1992). What we know about managing classrooms. *Educational Leadership*, 49(7), 74-77.

Fallon, C. & Brown, S. (2003). *E-learning standards: A guide to purchasing, developing, and deploying standards conformant e-learning*. Florida: St. Lucie Press.

Flake, C. L., Kuhs, T., Donnelly, A. & Ebert, C. (1995). Reinventing the role of teacher: Teacher as researcher. *Phi Delta Kappan*, 76(5), 405-407.

Franklin, H. L. (1988). *Principle consideration and its relationship to teacher sense of autonomy*. Unpublished doctoral dissertation, University of Oregon.

Gavin, T. (2003). Industry Report. *Training*, pp 21 – 45.

Goodyear, P., Salmon, G., Spector, J. M., Steeples, C. & Tickner, S. (2001). Competences for online teaching: A special report. *Educational Technology, Research & Development*, 49(1), 65-72.

Gratton-Lavoie, C. & Stanley, D. (2009). Teaching and learning principles of Microeconomics online: An empirical assessment. *Journal of Economic Education*, Winter, 3-25.

Hacifazlioglu, O., Sacli, O.A. & Yengin, I. (2005). Lecturers' attitudes towards the use of technology: Alternative strategies for faculty administrators. In *Proceedings of the Second International Conference* on eLearning for Knowledge-Based Society, August 4-7, Bangkok.

Hackman, J. R. & Oldham, G. R. (1975). Development of the Job Diagnostic Survey. *Journal of Applied Psychology*, 60, 159-170.

Hackman, J. R. & Oldham, G. R. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, 16, 250-279.

Hackman, J. R. & Oldham, G. R. (1980). *Work redesign*. Addison-Wesley Publishing Co.

Hair, J.F., Anderson, R.E., Tatham, R.L. & Black, W.C. (1998). *Multivariate data analysis*, New Jersey: Prentice Hall.

Hanson, E. M. (1991). *Educational administration and organizational behavior.* Boston: Allyn and Bacon.

Hanson, J. (2003). Encouraging lecturers to engage with new technologies in learning and teaching in a vocational university: The role of recognition and reward. *Higher Education Management and Policy*, 15(3), 135-149.

Harden, R.M. and Crosby, J.R. (2000). The good teacher is more than a lecturer: The twelve roles of the teacher. *Medical Teacher*, 22(4), 334-347.

Iiacqua, J. A. & Schumacher, P. (1995). Factors contributing to job satisfaction in higher education. *Education*, 116, 1.

Jaffee, D. (2003). Virtual transformation: Web-based technology and pedagogical change. *Teaching Sociology*, 31(2), 227-236.

Kelly, J. (1992). Does job re-design theory explain job re-design outcomes? *Human Relations*, 45(8), 753-774.

Kerr, E. (1986). Electronic leadership: A guide to moderating online conferences. *IEEE Transactions on Professional Communications*, 29(1), 12-18.

Kewell, B. & Beeby, M. (2003). Student and lecturer responses to the introduction of computer assisted learning (CAL) in a university business school. *Teaching in Higher Education*, 8(3), 413-430.

Kim, I. & Loadman, W. E. (1994) "Predicting teacher job satisfaction". (ERIC Document Reproduction Service No. ED 383707)

Kraft, P. (1977). *Programmers and managers*. New York: Springer-Verlag.

Latifah, A.L., Ramli, B., Zoraini Wati, A. & Nik Azlina, N.Y. (2004). *A Case of Teachers Coping as Distance Learners at the Open University Malaysia*.

Retreived June 21, 2007, from http://asiapacific-odl.oum.edu.my/C33/F221.pdf. Accessed 21 June 2007.

Lee-Ross, D. (2005). Perceived job characteristics and internal work motivation: An exploratory cross-cultural analysis of the motivational antecedents of hotel workers in Mauritius and Australia. *Journal of Management Development*, 24(3), 253-266.

Majchrzak, A. (1988). The human side of factory automation. San Francisco: Jossey-Bass.

Mannheim, B., Baruch, Y. and Tal, J. (1997). Alternative Models for Antecedents and Outcomes of Work Centrality and Job Satisfaction of High-Tech Personnel. *Human Relations*, 50(12), 1537-1562.

Marlia, P. (2007). E-learning in Malaysian public universities: Case studies of Universiti Kebangsaan Malaysia and Universiti Teknologi Malaysia. In *Proceedings of the 1st International Malaysian Educational Technology Convention*, November 2-5, Johor Bharu, Malaysia.

Mason, R. (1991). Moderating educational computer conferencing. *DEOSNEWS*, 1(19).

Mathieu, J.E., Hofmann, D.A. and Farr, J.L. (1993). Job Perception-Job Satisfaction Relations: An Empirical Comparison of Three Competing Theories. *Organizational Behavior and Human Decision Processes*, 56, 370-387.

McKeachie, W. J. (1997). Wanting to be a good teacher: What have we learned to date? In J. L. Bess (Ed.), *Teaching well and liking it: Motivating faculty to teach effectively*. Baltimore: Johns Hopkins University Press.

McMann, G. W. (1994). The changing role of moderation in computer mediated conferencing. *Proceedings of the Distance Learning Research Conference*, San Antonio, TX, April 27-29, 159-166.

Miller, T. W. & King, F. B. (2003). Distance education: Pedagogy and best practices in the new millennium. *International Journal Leadership in Education*, 3(3), 283-297.

Mitchell, R.L.G. (2009). Online education and organizational change. *Community College Review*, 37(1), 81-101.

Munz, D.C., Huelsman, T.J., Konold, T.R. and McKinney, J.J. (1996). Are There Methodological and Substantive Roles for Affectivity in Job Diagnostic Survey Relationships*? Journal of Applied* Psychology, 81(6), 795-805.

Neo, M. & Neo, T. (2009). Engaging students in multimedia-mediated constructivist learning – Students' perceptions. *Educational Technology & Society*, 12(2), 254-266.

Newble, D. & Cannon, R. A. (1994). *A handbook for teachers in universities & colleges: A guide to improving teaching methods*. London: Kogan Page.

Nunnally, J.C. (1978). *Psychometric Theory*. New York: McGraw-Hill.

Ostroff, C. (1992). The relationship between satisfaction, attitudes and performance: An organizational level analysis. *Journal of Applied Psychology*, 77, 963-974.

Poon, W. C., Low, L. T. & Yong, G. F. (2004). A study of web-based lLearning (WBL) environment in Malaysia. *The International Journal of Educational Management*, 18(6), 374-385.

Raja Maznah, R.H. (2004). *eLearning in Higher Education Institutions in Malaysia*. Retrieved June 26, 2007, from http://e-mentor.edu.pl/_xml/wydania/7/102.pdf.

Roberts, T. S. & Jones, D. T. (2000). Crossroads of the new millennium: Four models of online teaching. Proceedings of the *Technological Education and National Development Conference* on the April 8-10, Abu Dhabi, UAE.

Rosser, V. J. (2005). Measuring the change in faculty perceptions over time: An examination of their work life and satisfaction. *Research in Higher Education*, 46(1), 81-107.

Ryan, M., Carlton, K. H. & Ali, N. S. (2004). Reflections on the faculty in distance learning and changing pedagogies. *Nursing Education Perspectives*, 25(2), 73-80.

Sadker, M. P. & Sadker, D. M. (1991). *Teachers, schools, and society*. New York: McGraw-Hill.

Sammons, M. (1990). An epistemological justification for the role of teaching in distance education. In M.G. Moore (Ed.), *Contemporary issues in American distance education* (pp. 151-162). Oxford: Pergamon Press.

Shaiken, H. (1984). *Work transformed: Automation and labor in the computer age*. New York: Holt, Rinehart and Winston.

Shen, R., Wang, M. & Pan, X. (2008). Increasing interactivity in blended classrooms through a cutting-edge mobile learning system. *British Journal of Educational Technology*, 39(6), 1073-1086.

Siragusa, L. & Dixon, K.C. (2006). A research methodology: The development of survey instruments for research into online learning in higher education. *Issues in Educational Research*, 16(2), 206-225.

Steele, J.P. & Fullagar, C.J. (2009). Facilitators and Outcomes of Student Engagement in a College Setting. *The Journal of Psychology*, 143(1), 5-27.

Thakor, M.V. & Joshi, A.W. (2005). Motivating salesperson customer orientation: Insights from the job characteristics model. *Journal of Business Research*, 58(2005), 584-592.

Wegge, J., Van Dick, R., Fisher, G. K., Wecking, C. & Moltzen, K. (2006). Work motivation, organizational identification, and well-being in call centre work. *Work & Stress*, 20(1), 60-83.

Winter, R. & Sarros, J. (2002). The academic work environment in Australian universities: A motivating place to work. *Higher Education Research and Development*, 21(3), 241-258.

Zafeiriou, G. (2000). *Students' perceptions of issues arising from and factors influencing group interaction in computer conferencing: A grounded theory approach*. Unpublished doctoral thesis, University of Sheffield, UK.

Zimbalist, A. (Ed.). (1979). *Case studies on the labor process*. New York: Monthly Review.