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CONCEPTUALIZING TECHNOLOGY INFLUENCE ON JOB CHARACTERISTICS AND WORK OUTCOMES OF INSTRUCTORS IN INSTITUTIONS OF HIGHER LEARNING

ABSTRACT

This article conceptualized the framework of the possible impact of using different levels of technology on the roles and responsibilities of instructors in institutions of higher learning. Based on the literature reviewed, there is an indication that employees who use different types of technology in performing their tasks experience different degree of job attributes. This resulted in different levels of personal and work outcomes. This paper aims to examine any similar relationships among instructors who use different levels of instructional technology by employing Hackman and Oldham's (1980) JDS instrument to measure core job characteristics and work outcomes. A conceptual framework and several propositions speculating the relationships between levels of technology, job characteristics and work outcome were forwarded.

BACKGROUND OF THE STUDY

The primary role of an instructor, whether at the primary, secondary or tertiary levels, is to enhance students' learning. Traditionally, teachers were perceived to be experts and dispensers of knowledge, as educators (Esteve, 2000), as facilitators of group discussions and activities (Forsyth, Jolliffe and Stevens, 1999), and as mentors (Anderson and Shannon, 1995). These varied roles and responsibilities require teachers to be skillful in managing their time, resources and expertise. Teachers are thus expected to possess mainly in communication, interpersonal and management skills. In tandem with the varied roles and responsibilities of teachers, transformation in pedagogy could also be observed, where the focus now is shifting from "teacher-centered" to "learner-centered" or "active learning" (Karp and Yoels, 1976; Jaffee, 2003). In traditional teacher-centered learning, the teacher plays the "sage-on-the-stage" role while in a student-centered learning, the teacher assumes the "guide-on-the-side" roles where the students take an active role (rather than being passively taught), and get actively involved in learning through interactions with instructors and peers, sharing information, working in groups, and undertaking collaboration and mutual evaluation (Jaffee, 1997). The role of teachers has become less directive and more facilitative (Oliver and McLoughlin, 2001). Now, with the advent of new information and communication technology, there is an additional dimension in the teaching and learning environment. Teachers now have to deal with technology-mediated, independent learning, which some scholars see it as the teaching mode of the future (Ryan, Scott, Freeman and Patel, 2000).

The changing roles and expectations, shifting focus in pedagogy, and the advent of new information and communication technology, to a great extent have shifted the traditional teaching roles and responsibilities to incorporate facilitation that requires the use of technology-mediated media (Jarvis, 2002). Instructors need to adapt and modify their roles, undergo deskilling and re-skilling, and engage in a variety of new tasks and activities appropriate for in this new learning environment. As more institutions of higher learning are introducing new educational technology to support teaching, instructors in these institutions are

readily 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.

As expounded earlier, incorporating technology in the teaching-learning process should transform, or even require the addition of new roles and responsibilities. As such, the nature and characteristics of an instructor's job should also differ from the traditional roles of teaching depending on the sophistication level of the technology being adopted. In other words, the nature and characteristics of an instructor's job that does not utilize technology would be different from those that opt to use it. As such, it is interesting to know how the use of technology impacts the relationship between the roles and responsibilities of instructors and their job characteristics and work outcomes.

LITERATURE REVIEW

Previous studies have established that the nature and the characteristics of jobs is a source of employee motivation (see for example, Hackman and Lawler, 1971; Hackman and Oldham, 1976; Turner and Lawrence, 1965; and Oldham and Hackman, 1980). These findings were highly supported by other researchers (Stone, 1976; Fox and Feldman, 1988; Kiggundu, 1980; Renn and Vandenberg, 1995). Jobs that are meaningful, that create a feeling of responsibility, and that provide adequate feedback are more motivating and satisfying (Oldham and Hackman, 1980). In a technology-mediated teaching-learning environment, the instructors are not only required to have additional sets of technology-related skills but also to realize the fact that their roles and responsibilities are becoming less directive and more facilitative (Oliver and McLoughlin, (2001). This is a departure from the dominant teacher-centered model to student-centered approach (Harasim, Hiltz, Teles and Turoff, 1995). Therefore, instructors using different level of technology in teaching would be expected to experience different levels of motivation, job satisfaction and work performance. Oldham and Hackman (1980) also posited that employee work effectiveness is positively related to the job's motivating potential, and that job satisfaction also tends to increase as employees perceive their jobs as providing them with a sense of meaningfulness, knowledge of the results and sense of responsibility.

The Roles of Instructors

Several scholars (Goodyear, Salmon, Spector, Steeples and Tickner, 2001; Barker, 2002; Mason, 1991) have identified a number of teacher roles in the e-learning environment. Basically, they mentioned four major roles: *pedagogical/facilitator*, *managerial/organizational*, *technical* and *subject design*. However, it should be noted that these roles also exist in the traditional learning environment (McMann, 1994; Goodyear et al, 2001). These roles vary according to the type of technology and teaching approach used by teachers. The following section explains further the individual roles of teachers in both environments; traditional and e-learning.

Pedagogical Role

Traditional pedagogical role of teachers is to be the "sage on the stage" and act as the authority figures who perceive themselves as the source of knowledge. Instructions come from the teachers and the students are expected to listen and receive information passively. It is noted by Miller and King (2003) 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, give 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.

As the teaching approach eventually shifted from teacher-centered to student-centered, teachers have to play a new role, i.e. facilitator role. In the traditional environment, facilitation depends much on face-to-face and physical interactions between the facilitator and students. Heron (1999) and Gregory (2002) stressed that physical presence is an important factor that influence effectiveness of facilitation. According to Gregory (2002), facilitation is a process for people to use their internal capacities to learn and make sense

of their experience. As a facilitator, an instructor is to create conditions for individuals to choose, think and direct their own learning and development.

Managerial Role

To be effective, instructor needs to manage the resources and organize them in order to meet the specified timeframe. According to Sadker and Sadker (1991), an effective teacher must be a good manager who will organize the academic content and instruction. Educators are no longer focusing on controlling student behavior, instead 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.

Flakes, 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. Improper planning will lead to delay and postponement. 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. The ability to manage virtual teams through email contacts and online meetings is very important. Inability to synchronize dispersed students' activities and records would result in jeopardy.

Another significant change that instructors have to face in using e-learning method is the unlimited access of students to learning resources. Instructors should be able to manage the communication among students by monitoring the flow of conversation, encouraging comments, synchronizing and handling overload of information (Zafeiriou, 2000).

Besides managing classrooms and students, instructors need to develop and organize their own teaching portfolios (Flakes et al, 1995). Anderson (1993) mentions the importance of keeping teaching portfolio or dossiers as a medium to self evaluate teaching performance. Maintaining these portfolios helps to improve ways of teaching and provide suggestions for future lessons.

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. Instructors have to maintain regular communication with students in order to run the course. Inability to keep students informed about the course may result in students being lost and left unguided.

Technical Role

One of the skills that instructors should have in order to conduct an effective teaching is the ability to use supporting materials such as visuals, handouts, audiocassettes and power point slides. Given the wide range of teaching aids and technology, an instructor needs to choose the right media to communicate with students, to convey messages and to deliver teaching materials. According to Bennet and Lockyer (2004), in face-to-face mode, teachers require good skills to conduct effective presentation. Other than presentation method, case studies, roles plays and adventure learning are also used to reinforce learning. The use of teaching aids such as blackboard, projector, television, audio and video cassettes has to be coupled with the ability to match with the topic of the subject.

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

Usually an instructor's first step to prepare for class is to write the syllabus. In designing a course, a number of issues need to be addressed such as the course objective, course content, students' readiness, methods of delivery and availability of tools. Another factor that needs to be taken into account is the change in pedagogy (Ahmed, 2003). The change from traditional to student-centered learning demands an instructional delivery that promotes interactive learning and critical thinking. It also influences the type of methods and technology suitable for learning.

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.

Work Outcomes in Educational Settings

A study that looked into factors contributing to job satisfaction in higher education was conducted by Iacqua and Schumacher (1995). The results indicated that university teacher job satisfaction is significantly related with the challenges in the job, various skills required to perform the job and the financial support for research. The authors identify these factors as intrinsic variables. It is also found that extrinsic variables such as retirement programs and tenure are related to job dissatisfaction. The findings is consistent with Herzberg's motivational model (1987) that states satisfaction is influenced by the job facets and dissatisfaction is influenced by the job external factors.

Rosser (2005) conducted a study to measure the change in the *work life* and *satisfaction* among faculty over time. The study examined the changes in perceptions of faculty members' professional and institutional work life throughout the United States by comparing the survey conducted in the year 1993 and 1999. The quality of *work life* is measured by using three dimensions; *technology support*, *professional development* and *administrative support*. *Satisfaction* is measured by asking the respondents to rate their evaluations on *advising and course workload (such as teaching, advising students and making decisions related to the subjects taught)*, *quality of their students, benefits and security* and their *overall satisfaction*. The findings show that *work life* contributes significantly to the faculty members and their perceptions towards quality work has changed over time. On the faculty members' *satisfaction*, all the dimensions are rated positive and the respondents' satisfaction has significantly improved since 1993. The author noted that the improvement may be influenced by the people who work with the faculty members and changes in individual characteristics and perceptions toward work life.

In his study that comprises teachers from 23 universities in the United Kingdom, Oshagbemi (1997) uses eight criteria to measure job satisfaction. The criteria are *teaching, research, nature of administration and management, present pay, promotions, supervision, co-workers' behavior* and *physical working conditions*. The study groups the university teachers into three: *happy workers* (who enjoy the extrinsic factors of the job), *satisfied workers* (who enjoy the primary functions of teaching and research) and *unhappy workers*. The *happy* and *satisfied workers* form the highest percentage of the workforce in the higher education.

Prior researches indicate that most university teachers are motivated internally more than they are externally. However, the fact that some teachers are still driven by external rewards such as pay, promotion, status and other materials gains gives the indication that no matter how motivating a job is, external rewards are still important factor to be looked at. Dubitskii (2005) has pointed out the issue on the motives for the activity of college and university instructors. He mentioned that the behavior and commitment of instructors are influenced by many underlying factors.

Prior studies in examining the work outcomes in the educational setting are not only limited to the higher education level. Researchers have been studying job satisfaction and motivation of teachers in the elementary and secondary level. In her PhD thesis, Ellis (1986) explored the relationships among job

design, supervisory behaviors and teacher motivation. It was found that teachers who perceived high degree of the core job attributes were more internally motivated than those who did not.

A study conducted by Delle Fave and Massimini (2003) investigates the optimal experience in work and leisure among teachers and physicians. Three out of twelve activities are rated as highest in giving optimal experience in life: *work*, *reading* and *leisure*. Among the teachers, reading is chosen as the activity that gives optimal experience in their daily life and teaching is rated as the third highest next to leisure. When asked to report the *work* situations associated with the most positive experiences, both teachers and physicians quoted getting positive feedback from their job. As for teachers, their sources of feedback are mainly referred to students' attention and involvement. The teachers also quoted the most negative experience at *work* when they get no feedback from students, poor participation, disengagement and no interest in the subject matter. Another interesting finding is, unlike the physicians, teachers related the most positive experiences at work to the satisfaction of obtaining work achievements through the use of professional skills. This finding is consistent with Hackman and Oldham's Job Characteristics Model (1980) that states the more variety in skills would give more meaningful experience to employees.

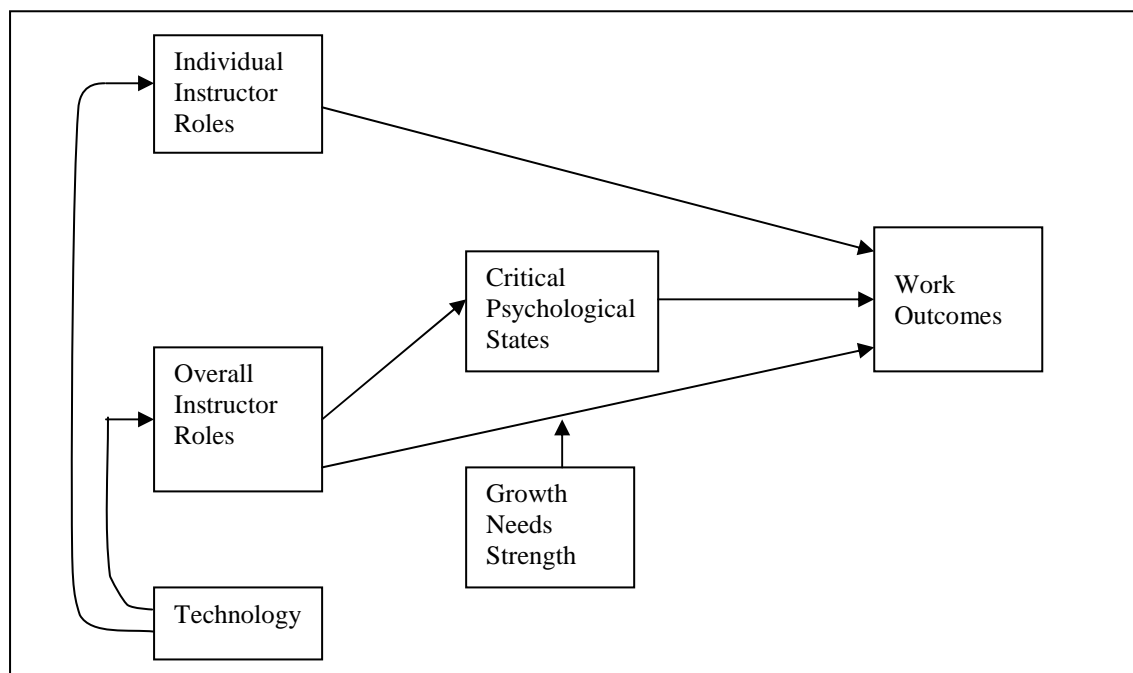
Much of the prior research has revealed that autonomy is a facet of teacher motivation (Khmelkov, 2000; White, 1992; Wilson, 1993) and indicative of job satisfaction (Kim and Loadman, 1994; Klecker and Loadman, 1996). Teachers have the sense of freedom to make important decisions that control certain aspects of their work life such as scheduling, curriculum, textbooks and instructional planning (Klecker and Loadman, 1996).

Kim and Loadman (1994) conducted a study to predict factors that lead to teacher job satisfaction. The study that involved 2054 teachers indicated that teacher job satisfaction is associated with intrinsic and extrinsic rewards. The findings are further supported by a survey done by Klecker and Loadman (1996) when a high positive linear correlation was found between a teacher empowerment and teacher job satisfaction.

THE CONCEPTUAL FRAMEWORK

Based on the literature reviewed, that covers the relationships between technology, instructor roles and responsibilities and work outcomes, we proposed a framework that conceptualized the relationships between different levels of technology and instructor roles, and the entailing differences in work outcomes. The framework, as depicted in Figure 1 below, utilized Hackman and Oldham's (1976, 1980) Job Characteristics Model to assess the teaching job characteristics of instructors and its relationship with work outcomes. This is because it is one of the most influential theories in organizational theory, that it has served as the basis for many job redesigns interventions over the past two decades, and the validity of the model has been supported by most researchers (Behson, Eddy and Lorenzet, 2000). Technology used in teaching ranged from the 'chalk-and-talk', the lowest form, to the 'anytime, anywhere, on-line, real-time', the highest form. Depending on the usage of these different forms of technology, the characteristics of the roles and responsibilities of instructors would also differ. The differences in the role characteristics would eventually bring about differences in their levels of motivation, job satisfaction and work effectiveness.

Figure 1: The Conceptual Framework



PROPOSITIONS

Much has been written on the impact of technology on job attributes and employee requirements in various industry settings. Majority of scholars (for example Blauner, 1964; Zisman, 1978; Riche, 1982; Adler, 1986) concur that the use of technology in job performance enhances the skill requirement, job complexity, job challenges, feedback, autonomy and independence of workers. Most of these studies mainly involved lower level jobs that require lower level skills. A study among middle managers has also supported these results (Millman and Hartwick, 1987). In addition, Collins and King (1988) found that the use of computer aided design system (CAD) increases employees' job complexity, autonomy, skill variety and feedback.

Several scholars (Mason, 1991; Barker, 2002; Goodyear et al. 2001) view that instructors or teachers who use more advanced technology in teaching and learning acquired more skills and performed more tasks as compared to those who use lower level technology. The performance of these roles requires different level of job complexity and challenges given the different teaching and learning environment that changes the amount of physical interaction, the methods to impart knowledge and the access into learning materials. Since the reliability and validity of these roles (pedagogical, managerial, technical and subject design) are not empirically tested, their characteristics are measured using the JDS job characteristics instruments items (namely skill variety, task significance, task identity, autonomy and feedback). Thus, they are measured using the summary index of job characteristics; Motivating Potential Score (MPS) as formulated by Hackman and Oldham (1980). Based on these arguments, a general proposition is forwarded:

Proposition 1: Teaching characteristic roles differ among instructors using different levels of teaching technology

It is noted by many researchers (e.g. Mason, 1991; Barker, 2002; Goodyear et al. 2001; Kerr, 1986; Sammons, 1990; Zafeiriou, 2000) that the use of technology in teaching influence the type of skills and tasks performed by the instructors. This makes the job of the instructors more challenging and complex. As suggested by previous studies, more challenging jobs may result in higher internal motivation, satisfaction and performance (Hackman and Oldham, 1980; Stone, 1976; Fox and Feldman, 1988; Kiggundu, 1980; Ellis, 1986; Street and Licata, 1988; McKeachie, 1997; Khmelkov, 2000; Delle Fave and Massimini, 2003; Rosser, 2005; Iacqua and Schumacher, 1995; Oshagbemi, 1997); it is thus proposed that the instructors who use higher level technology in their teaching jobs would experience higher internal motivation, satisfaction and work effectiveness. As expounded in the literature, the teaching jobs of instructors are basically comprised of four different roles namely *pedagogical* (Jarvis, 2002; Jaffee, 2003; Gregory, 2002; Ryan et al., 2004; Loveless et al., 2001; Black and Holford, 2002; Bennet and Lockyer, 2004), *managerial* (Sadker and Sadker, 1991; Galton, Simon and Croll, 1980; Flakes, 1995; Anderson, 1993), *technical* (Bennet and Lockyer (2004) and *subject designing* (Jaffee, 2003; Black and Holford, 2002; Bennet and Lockyer, 2004). These roles would be more challenging with the use of technology and require more skills. Many scholars have studied on how all these roles have been influenced by technology (Mason, 1991; Goodyear et al., 2001; Bennet and Lockyer, 2004; Barker, 2002; Jaffe, 1997). As such, the following propositions are forwarded:

Proposition 2: Instructors who have higher **pedagogical MPS** and use higher level of technology experience higher level work outcome compared to instructors who are otherwise experience higher level of work effectiveness compared to instructors who are otherwise

Proposition 3: Instructors who have higher **managerial MPS** and use higher level of technology experience higher level work outcome compared to instructors who are otherwise higher level of work effectiveness compared to instructors who are otherwise

Proposition 4: Instructors who have higher **technical MPS** and use higher level of technology experience higher level work outcome compared to instructors who are otherwise

Proposition 5: Instructors who have higher **subject design MPS** and use higher level of technology experience higher level work outcome compared to instructors who are otherwise

The preceding research question (Research Question 2) seeks to examine how the individual teaching roles and responsibilities that are influenced by technology affect work outcomes. Thus, it is interesting to study how the teaching job of instructors as a whole using different level of technology influence works outcomes. Numerous studies have been conducted to examine the influence of job characteristics on work outcomes using Hackman and Oldham's (1976, 1980) JCM. Despite the criticism and inconsistent results by several researchers (Dunham, Aldag and Brief, 1977; Roberts and Glick, 1981; Sims, Szilagi and Keller, 1976), the model is highly supported by some other studies (Stone, 1976; Fox and Feldman, 1988; Kiggundu, 1980). The motivational model proposed by Herzberg (1976) also suggested the same evidence when he found that enriched jobs would result in higher internal motivation and satisfaction.

In the education setting, numerous studies have also been conducted. These studies (Ellis, 1986; Street and Licata, 1988; McKeachie, 1997; Khmelkov, 2000, White, 1992; Wilson, 1993; Delle Fave and Massimini, 2003; Kim and Loadman, 1994) which employed the Job Characteristics Model to examine teachers' work outcomes found consistent findings. Studies conducted in university setting further generated supporting evidences (Rosser, 2005; Iacqua and Schumacher, 1995; Oshagbemi, 1997). Since the JCM proposed by Hackman and Oldham (1980) was originally used to measure jobs, thus it is interesting to examine how the teaching job of instructors influence the work outcomes. Thus, the following proposition is forwarded for testing:

Proposition 6: Instructors who have higher overall teaching MPS and use higher level teaching technology experience higher level work outcome compared to instructors who are otherwise

As originally conceived, Hackman and Oldham's (1976, 1980) JCM also included the individual employees' characteristics of growth need strength (GNS) as a moderator of the relationship between the characteristics of the job and the outcome variables. Hackman and Oldham assumed that one of the most important work values is the job incumbent's need for personal growth and development through his or her job. Employees with high GNS should respond more positively to jobs that have high levels of the five core dimensions (skill variety, task significance, etc.) than employees with low GNS. As such, the following proposition is forwarded:

Proposition 7: Instructors who have higher growth need strength, higher overall teaching MPS and use higher level teaching technology experience higher level work outcomes compared to instructors who are otherwise

In their JCM, Hackman and Oldham (1980) suggested three key conditions that must be present for improved work outcomes to occur. The person should experience knowledge of the results of the work, experience responsibility of the results and experience the work as meaningful. Previous studies (such as Johns, Jia and Yongqing, 1992; Renn and Vandenberg, 1995; Barnabe and Burns, 1994) show strong support to this theory. Thus, for the present study, it is imperative to examine the mediating effect of the CPS. Since the present study uses the summary measure of job design; i.e. MPS, a summary measure of CPS will be used by summing the values of the three states. This method has been used in by Johns et al., (1992). However, as contended by Johns et al (1992), the total CPS is used so that it is in line with the summary measure of job characteristics; i.e. MPS. The following proposition is forwarded:

Proposition 8: Instructors who have higher overall teaching MPS and use higher level teaching technology experience higher total CPS and results in higher level work outcomes compared to instructors who are otherwise

CONCLUSION

Based on the likelihood of the probable impact of technology on instructor's job characteristics as shown above, it is imperative that an in-depth study to examine these propositions be conducted. Past studies in linking technology and job designs focused in selected industries or economic sectors such as manufacturing (Child, 1984; Gunn, 1987; Helfgot, 1988; Majchrzak, 1988, Mortimer, 1985; Shaiken, Herzenberg & Kuhn, 1986), and nursing (Quintana, 1984; Leatt and Schneck, 1981). Studies conducted in manufacturing sector did not use technology as the sole factor that impacts job designs as other factors were also included such as organization design and structure that had significant impact on job characteristics (Dean & Snell, 1991; Kelley, 1990; Shaiken et al, 1986). The types of technologies used in the two sectors were different as they were uniquely designed for certain purposes. As such, some of the research findings may not be relevant to education institutions and cannot be generalized to other economic sectors.

The few studies conducted in education were mainly confined to the potential impact of technology on organizations, learners and teachers (Rosenberg, 2001; Hiltz & Wellman, 1997; Corston & Colman, 1996; Fussell & Benimoff, 1995; Gefen & Straub, 1997). These studies did not examine in depth the changes in the work of instructors. More importantly, there are not that many studies examining how the different functions and characteristics of technology could impact instructors' tasks in the new learning environment. Therefore, to better understand these aspects we need to compare examine the differences between the job characteristics of teachers in the traditional and the new learning environments.

The proposed framework also showed the probable impact of technology on work outcomes such as motivation, job satisfaction and work effectiveness. A number of researchers have studied the association between job characteristics of teachers and the work outcomes (for example, see Frase and Heck, 1992; Rosenbach, Gregory and Taylor, 1983; Rosenblatt and Inbal, 1999). The findings from these studies showed positive relationships between the characteristics of the job and the work outcomes like motivation, satisfaction and behavior. However, these studies only focus on teachers teaching in the traditional environment. As such, it is important to study the influence of technology on the relationship which may give different implications on motivation, satisfaction and work effectiveness.

This framework also has important implications to management of higher educational institutions. The use of technology in teaching and learning requires the administrators to ensure that instructors get proper training, resources, tools and support. Lack of support and training may influence the effectiveness of technology use and this may render huge investment in technology useless. These issues, if not well managed, may lead to ineffective teaching and learning.

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