BUSINESS SCHOOL FACULTY PERCEPTIONS OF CLICKERS TECHNOLOGY AND ASSESSMENT OF CLICKERS TECHNOLOGY USAGE: DOES RANK MATTER?

Kellye Jones, Clark Atlanta University
kjones@cau.edu

Amiso George, Texas Christian University
a.george2@tcu.edu

ABSTRACT

This study investigates whether perceptions of clickers technology differs by faculty rank. Additionally, course and instructor evaluations of clickers based and non-clickers courses are examined. Whether differences exist in evaluations of clickers and non-clickers courses based on faculty rank is also explored. An ANOVA analysis reveals that assistant, associate, and full professors differ in their clickers technology perceptions. Courses with clickers were evaluated more favorably, and there are faculty rank differences in course and instructor evaluations of clickers and non-clickers courses.

INTRODUCTION

The downturn in the economy has created challenges in higher education. Many U.S. colleges and universities are operating with fewer resources and tighter budgets. Subsequently, available resources are closely scrutinized in order to increase efficiencies. One area, prone to examination and change, is class size. As such, a vast number of courses are taught in large sections. This is particularly true for the core courses in a major. Tweaking core courses to accommodate large enrollments may address budget concerns but it presents a different set of challenges for both instructors and students. Instructors are often confronted with capturing and maintaining the attention of students and gauging levels of student comprehension and learning. Instructors also grapple with motivating students and facilitating engagement. For students, larger enrollments pose challenges to attendance, engagement, motivation to learn, and attention (Steinert & Snell, 1999).

Given these circumstances, many instructors are increasingly interested in reducing the challenges posed by large sections. One approach aimed at improving the classroom experience is introducing clickers technology. According to a 2010 *Chronicle of Higher Education* report, approximately 13% of faculty surveyed use clickers. Clickers technology, also known as an Audience Response System, provides instructors the opportunity to pose questions to students during a lecture and receive immediate feedback. The technology is relatively easy to use and requires an intermediate level of computer skill (Cue, 1998). Clickers technology consists of a handheld device equipped with software that transmits data to a wireless receiver that is connected to a computer. In essence,

once questions are presented to students via clicker they respond by selecting correct answers through the handheld device. Upon receipt of the answers, instructors can reveal the responses and proceed accordingly.

While clickers technology has been widely accepted (Deal, 2007), varying attitudes about the technology exist. Studies have explored student attitudes (Draper, 2002, Beekes, 2006) however, few studies investigate instructor attitudes. More specifically, little is known about Business School Faculty attitudes. This population is of particular interest and given their discipline, there should be a heightened sensitivity to innovation, recognizing the need for and embracing change, and the significance of responding to stakeholder needs.

Increased awareness of instructor attitudes is also important given the ranking scheme within academic institutions which typically demonstrates a generational hierarchy. In their investigation of university faculty and technology use, Xu and Meyer (2007) report that age was a significant factor related to faculty technology use. Assessing instructor attitudes would yield additional information and provide useful insights regarding technology teaching strategies. Differential attitudes about clickers technology may be due, in part, to one's exposure to and comfort with technology in general. In fact, studies reveal that both exposure to and attitudes toward technology are shaped by generational values (Stone, 2010).

The focus of this study is to examine instructor perceptions of clickers technology and whether differences based on instructor rank exist. Course and instructor evaluations of clickers and non-clickers courses are also explored. Whether differences in evaluations exist based on instructor rank is another area of investigation. First, the study discusses generations and technology use. Next, business school faculty characteristics are provided. Third, implementing clickers technology is covered. Fourth, the motivations for clickers use are examined. Fifth, business school faculty and technology usage is covered. Next, business school students' exposure to technology is discussed. Instructor perceptions of clickers, and clickers and course and instructor evaluations are the last areas of exploration. Diffusion theory, methodology, results, and discussion are the remaining areas of coverage.

TECHNOLOGY USAGE ACROSS GENERATIONS

Technology is pervasive in US society. Exposure to various technologies occurs early in the lifecycle, is constant, and is continuously changing. As a result of this exposure, young people are more tech savvy than older generations (Perez, 2009; Stone, 2010). This is due, in part, to the accelerated pace in which technological changes are introduced. Fast-paced changes have created a series of mini-generation gaps where young people are heavily influenced by the technological tools available in their formative years (Stone, 2010). In an examination of multi-tasking and free time behavior, where free time was watching television, and tasking included texting, instant messaging, and Facebooking, 16-18 year olds perform an average of seven tasks; 20 year olds perform about six; and 30 year olds perform about five (Stone, 2010).

The technology generational gap has also been examined in the workplace. Perez (2009) reports on a study that reveals technology and software usage. Baby-boomers aged 44-60, members of Generation X aged 29-43, and members of Generation Y aged 28 and younger comprised the

study. Marked differences were found between Boomers and Generation Y. In fact, two-thirds of Boomers believe that PDA's and mobile phones contribute to the decline in workplace etiquette, and using a laptop during a meeting is distracting while less than half of Generation Y agreed. Twenty-eight percent of Boomers find blogging about work related issues acceptable as compared to 40% of members from Generation Y. Members of Generation Y were more inclined to access a social network from work as compared to Boomers, 62% and 14% respectively. Generation Y also reported spending about 10 hours a day online compared to about five hours for Boomers. Another study reporting on the technology use of professional Boomers asserts that using technology creates efficiencies in operations. As such, a reluctance to adopt technology will create a disadvantage making their firms less competitive than their wired counterparts (IOMA, 2009).

BUSINESS SCHOOL FACULTY CHARACTERISTICS

A generational depiction within the academic milieu is faculty rank. A recent AACSB report reveals various characteristics of business schools and their faculty (AACSB, 2011). Approximately 2044 business schools were represented in the report and within these schools, roughly 27,580 full-time faculty were identified. Among the schools represented in the report, roughly 46% of the faculty positions were full-time and tenured, and 19% were full-time non-tenure, tenure track and 17% were full-time non-tenured track. With respect to the tenure status of full-time faculty, 56% are tenured, 23% are untenured on tenure track, and 20% are non-tenured track. Faculty tenure status provides guidance in recognizing the significance of the academic hierarchy.

IMPLEMENTING CLICKERS TECHNOLOGY IN THE CLASSROOM

Deal (2007) identifies three basic approaches to implementing clickers technology. The most basic approach entails classroom monitoring. Within this context the technology is used to take attendance and encourage participation. Very few instructional changes are made with respect to the discussion and delivery of course material. At the next level, the instructor uses the technology to ascertain comprehension of concepts. Given student responses, assessments are made as to whether the lecture should proceed or, if further explanation of a concept is required. Students, by way of the technology, signal their level of confusion or understanding. The last approach entails examining teaching strategies and philosophies. At this level there is enhanced interaction as students respond to the clickers question and the instructor re-directs the discussion with additional engagement of students.

INSTRUCTOR MOTIVATIONS AND CLICKERS USAGE

Technological tools have been used in order to facilitate the engagement of students in classes with large enrollments. Clickers, in particular, have been secured in order to move beyond a one-way communication style that is prevalent in lecture halls. Shortcomings of the traditional one-way method of lecturing include limited student motivation to attend and pay attention in class, and the inability of students to learn complex and difficult course material (Draper, 1998). Introducing clickers technology is designed to address the aforementioned limitations by engaging students, making them more active in class and providing an opportunity for personal

involvement (Wood, 2004).

Increased student participation, attention, and understanding are specific rationales associated with using clickers. Despite increased class sizes, students are able to weigh-in on questions posed by an instructor. This interaction tends to be compromised in a more traditional, large lecture environment since too many students refrain from contributing to a discussion. Sources of their reluctance include: fear of making a mistake when articulating thoughts, fear of providing an incorrect response, fear of public embarrassment, and peer pressure not to engage in the classroom (Draper, 1998). Clickers may also be used to jumpstart a student's focus and attention. By inserting questions throughout a lecture, instructors may reduce mental fatigue and enhance recall. This is particularly salient at the beginning of class. In his study, Burns (1985) reports that the first five to 15 minutes of a lecture is the most memorable and the latter parts of a lecture become increasingly fuzzy. Moreover, the average attention span is about 20 minutes and recall drops precipitously after about 20 minutes.

Enhanced understanding of course material can be achieved with clickers technology. By inserting questions in the lecture, students are able to gauge their understanding, or lack thereof, of material and adjust accordingly. This is not only beneficial for the student, but the instructor too. The instructor also becomes aware of whether students are grasping the material as well as the degree of mastery (Wood, 2004). Subsequently, the instructor can course correct in order to respond to the level of understanding. Likewise, the instructor may surprisingly discover that a topic has been given sufficient coverage and the instructor can proceed with additional material. When using clickers to gauge understanding, the instructor needs to demonstrate flexibility. Since the responses are generated and received in real time, the instructor will need to handle the unexpected and proceed accordingly.

BUSINESS SCHOOL FACULTY AND TECHNOLOGY USAGE

Studies have explored the technology use of business school professors. In their study comparing academic technology use across disciplines, Guidry and Lorenz (2010) report that business and professional faculty are high users of technology and they use technology significantly more than their peers in other disciplines. Ball and Levy (2008) explored the factors that influence the technology use of information systems professors. The variables under investigation included computer self-efficacy, computer anxiety, and experience with using technology. The results indicate that computer self-efficacy has the most significant impact on a professor's intent to use technology. In their investigation of business faculty use of technology, Zhao, Alexander, Perreault and Waldman (2007) indicate that faculty more frequently used Internet related technologies. Moreover, the results indicate that faculty rate Internet and web oriented discussion groups a productivity enhancer. Buzzard, Crittenden, Crittenden and McCarty (2011) report that business faculty prefer to use course learning technology and they have stronger technology preferences than professors in fine arts and life sciences.

BUSINESS SCHOOL STUDENTS EXPOSURE TO TECHNOLOGY

Schools of business are increasing the technology offerings that enhance student exposure. This is done in part to facilitate better learning of subject matter. These schools also recognize that

given the significance of technology in the workplace, students will need experience and facility of various technologies. In their investigation of student comfort level with using software to analyze business problems, Cauley, Aiken and Whitney (2010) found that greater comfort levels relate to greater proficiency scores. In Buzzard, Crittenden, Crittenden and McCarty's (2011) report, business students have stronger technology preferences than students in fine arts and life sciences. In a study of IT and pedagogical perspectives, Crandall, Lim and Ro (2010) report that business students were not distracted by technology aids used in class. They also reveal that these students would prefer greater use of technology in class. Campus Technology (2009) reports that 38% of the students in their study believe that instructors understand technology and integrate it in the classroom. Ilacqua, Park, Gannon and Allen (2007) report on the introduction of software in order to increase student interaction through the use of collaborative note-taking. Macro-economics students were subjects in the study and they reported a positive experience with the technology.

INSTRUCTOR PERCEPTIONS OF CLICKERS TECHNOLOGY

In general, instructor perceptions of clickers are favorable. Instructors indicate that clickers assist the learning process by gauging understanding. Draper (2002) reports that instructors modify their teaching based on student responses thereby providing what students believe they need with respect to instruction. Beekes (2006) finds that students appear to be more receptive to technical material. Elliot (2003) suggests that the technology stimulated student interest and their ability to concentrate which improved their class performance. Beatty (2004) reports that students are more attentive during class and that fewer students slept during lectures. Wood (2004) reveals that instructors found the technology to be far more enjoyable than the traditional approach to teaching.

While instructor perceptions of clickers tend to be positive, there are concerns about the technology. Less than positive attitudes are attributed to technology issues, preparation time, and decreased lecture time. Proper support from information technology (IT) departments is critical. When the system encounters problems instructors believe that IT should have the capability to quickly trouble-shoot and problem solve (Brewer, 2004). When this does not occur, instructors become disenchanted with the technology. Moreover, some instructors dread the training required prior to usage. Interestingly, the source of apprehension may be that they are either tech savvy and believe the training to be a waste of time or, they are tech challenged and believe the training will be overwhelming. Increased preparation for clickers based courses is another area of discontent among instructors. It seems that some instructors believe that the process of creating questions and placing them in the proper format is somewhat onerous and contributes to their course preparation time. Another concern among instructors is the decreased lecture time and subsequently, the limited coverage of material (Simpson & Oliver, 2006). Believing that less time will be devoted to course material creates apprehension about the value of the technology and the outcomes associated with using it.

CLICKERS TECHNOLOGY AND COURSE AND INSTRUCTOR EVALUATIONS

Studies indicate that clickers technology have a positive impact on course evaluations. Miller (2003) reports that students who attended a course with clickers technology rated both the lecture

and the speaker higher than students not using the technology. Similarly, Copeland (1998) finds that lectures using clickers technology were rated higher than lectures not using the technology. Instructor evaluations yield similar results. Nichol and Boyle (2003) state that students believed that instructors were more cognizant of their needs and viewed instructor teaching styles as warm and friendly. Copeland (1998) reveals that instructors using clickers were rated more favorably than those not using the technology. Interestingly, the results remained consistent even when an instructor taught one course with the technology and another course without it.

DIFFUSION THEORY

Numerous studies have examined diffusion theory and the factors that help or hinder adoption of an idea. One of the most frequently discussed theories is the Diffusion of Innovations concept developed by Everett Rogers (1995). Specifically, Rogers (1995) describes five constructs that may be used to explain the adoption or rejection of an innovation: (1) *relative advantage* [perceived to be better than current idea, practice, and so on]; (2) *compatibility* [perceived to be consistent with current goals and experiences]; (3) *complexity* [perception of degree of difficulty to use]; (4) *trialability* [perception as to experiment time]; and (5) *observability* [perception of how visible results are to others]. Davis (1989) offers an alternative but complementary theory, the Technology Acceptance Model, which suggests that *perceived usefulness* and *ease of use* affect the adoption process. Several studies (Davis, 1989; Karahanna, Straub & Chevany, 1999) indicate that these factors [*perceived usefulness* and *ease of use*] are somewhat comparable to *relative advantage* and *complexity*, respectively, and these factors relate to adoption.

SAMPLE AND METHODS

Eighty-five instructors of Business Administration participated in the study. The instructors taught at one of three large state schools in the Southwest. Instructors taught a Principles of Management, Principles of Marketing, or a Principles of Accounting course during the Fall, 2009 or Spring, 2010 semesters. All courses are required for Business Administration majors. Twenty-nine of the instructors were assistant professors, 28 were associate professors, and 28 were full professors.

The instructors taught a section of Principles of Management, Principles of Marketing, or Principles of Accounting that used clickers technology. Instructors also taught a section of Principles of Management, Principles of Marketing, or Principles of Accounting that did not use the technology. In total, 56 sections of Principles of Management, 52 sections of Principles of Marketing, and 68 sections of Principles of Accounting were surveyed. Instructors taught from common syllabi. Each instructor created clickers questions that were used during the semester. All instructors were familiar with clickers technology and had previously taught at least one semester using the technology.

During lectures throughout the semester, instructors inserted three to five clickers generated questions. Students responded to the questions via clicker during each class. At the end of the semester, instructors completed a self-assessment instrument that examined their attitudes toward clickers technology. Demographic information was also collected. Course and instructor evaluation data were supplied by Department Chairs. Scores on the course and instructor

evaluation instruments range from one (least effective) to five (most effective).

The questionnaire is a modification of the instrument used by Crossgrove and Curran (2008). Attitudes are assessed with four variables including: engagement, understanding, learning, and strategy. The constructs for each variable include: ENG involvement, ENG attention, ENG interaction, ENG participation, UBU understanding, USH score higher, LMOT motivated to learn, LCON connect ideas, SINTT, interactive teaching, SINLRN, interactive learning, SACLAS active classroom, SSDIS shift discussion, SCLAST, devote class time to questions. In total, the four variables were measured by 13 items using a Likert scale that ranges from strongly disagree (1) to strongly agree (5).

The ANOVA technique was used to analyze the hypotheses. Four hypotheses were generated about differences in perceptions of the technology and four hypotheses examine course and instructor evaluations.

H $_1$: The perception that the clicker enables better engagement in the classroom will differ by faculty rank.

H $_2$: The perception that the clicker enables greater understanding of course material will differ by faculty rank.

H $_3$: The perception that the clicker enables greater learning of course material will differ by faculty rank.

H $_4$: Instructor technology strategy will vary by faculty rank.

H $_5$: Course evaluations of instructors teaching with clickers will differ from instructors not teaching with a clicker.

H $_6$: Instructor evaluations of instructors teaching with clickers will differ from instructors not teaching with clickers.

H $_7$: Course evaluations of instructors teaching with clickers will vary by rank.

H $_8$: Instructor evaluations of instructors teaching with clickers will vary by rank.

RESULTS

Table 1 illustrates that the results of the ANOVA analysis were significant at the .01 level and all hypotheses were supported. The perception that clickers technology enables better engagement (H$_1$), understanding (H$_2$), and learning (H$_3$) varied by faculty rank. Instructor technology strategy also varied by faculty rank (H$_4$). Course and instructor evaluations of clickers users differed from their non-clickers using counterparts (H$_5$, H$_6$). Course and instructor evaluations of clickers and non-clickers users varied by faculty rank (H$_7$, H$_8$).

TABLE 1. ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
ENGINV	Between Groups	23.491	2	11.745	35.917	.000
	Within Groups	26.815	82	.327		
	Total	50.306	84			
ENGATT	Between Groups	34.593	2	17.297	46.917	.000
	Within Groups	30.230	82	.369		
	Total	64.824	84			
ENGINT	Between Groups	22.859	2	11.430	29.693	.000
	Within Groups	31.564	82	.385		
	Total	54.424	84			
ENGPAR	Between Groups	35.288	2	17.644	48.869	.000
	Within Groups	29.606	82	.361		
	Total	64.894	84			
UBU	Between Groups	37.433	2	18.717	32.992	.000
	Within Groups	46.520	82	.567		
	Total	83.953	84			
USH	Between Groups	40.975	2	20.487	31.089	.000
	Within Groups	54.037	82	.659		
	Total	95.012	84			
LMOT	Between Groups	47.362	2	23.681	59.155	.000
	Within Groups	32.826	82	.400		
	Total	80.188	84			
LCON	Between Groups	52.643	2	26.322	62.417	.000
	Within Groups	34.580	82	.422		
	Total	87.224	84			
SINTEAC	Between Groups	86.058	2	43.029	96.156	.000
	Within Groups	36.695	82	.447		
	Total	122.753	84			

SINLEA	Between Groups	78.674	2	39.337	69.788	.000
	Within Groups	46.220	82	.564		
	Total	124.894	84			
SICLASS	Between Groups	106.097	2	53.048	126.118	.000
	Within Groups	34.491	82	.421		
	Total	140.588	84			
SSDISC	Between Groups	122.515	2	61.258	117.615	.000
	Within Groups	42.708	82	.521		
	Total	165.224	84			
SCLAST	Between Groups	105.232	2	52.616	120.981	.000
	Within Groups	35.663	82	.435		
	Total	140.894	84			
CEVALC	Between Groups	40.385	2	20.192	249.161	.000
	Within Groups	6.645	82	.081		
	Total	47.030	84			
CEVALNCL	Between Groups	27.151	2	13.575	113.901	.000
	Within Groups	9.773	82	.119		
	Total	36.924	84			
IEVALC	Between Groups	45.473	2	22.737	326.459	.000
	Within Groups	5.711	82	.070		
	Total	51.184	84			
IEVALNC	Between Groups	35.044	2	17.522	155.701	.000
	Within Groups	9.228	82	.113		
	Total	44.272	84			

Given the significance of the ANOVA analysis, Tukey's HSD post hoc test of group differences was executed. Table 2 reveals the specific, statistically significant differences between the faculty groups. This analysis reveals that full professors differed from assistants and associates in their engagement and understanding perceptions of the technology. For the learning variable, there were differences between all faculty groups. For the strategy variable, full professors differed from assistants and associates on the interactive teaching, interactive classroom, and shift discussion constructs. There were differences between all faculty groups on the interactive learning, and devote class time constructs for the strategy variable.

TABLE 2. TUKEY'S HSD MULTIPLE COMPARISONS

Dependent Variable	(I) RANK	(J) RANK	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
ENGINV	1.00	2.00	.08744	.15151	.833	-.2742	.4491
		3.00	1.15887*	.15151	.000	.7972	1.5205
	2.00	1.00	-.08744	.15151	.833	-.4491	.2742
		3.00	1.07143*	.15283	.000	.7066	1.4362
	3.00	1.00	-1.15887*	.15151	.000	-1.5205	-.7972
		2.00	-1.07143*	.15283	.000	-1.4362	-.7066
ENGATT	1.00	2.00	.19089	.16087	.465	-.1931	.5749
		3.00	1.44089*	.16087	.000	1.0569	1.8249
	2.00	1.00	-.19089	.16087	.465	-.5749	.1931
		3.00	1.25000*	.16227	.000	.8627	1.6373
	3.00	1.00	-1.44089*	.16087	.000	-1.8249	-1.0569
		2.00	-1.25000*	.16227	.000	-1.6373	-.8627
ENGINT	1.00	2.00	.06034	.16438	.928	-.3320	.4527
		3.00	1.13177*	.16438	.000	.7394	1.5241
	2.00	1.00	-.06034	.16438	.928	-.4527	.3320
		3.00	1.07143*	.16582	.000	.6756	1.4672
	3.00	1.00	-1.13177*	.16438	.000	-1.5241	-.7394
		2.00	-1.07143*	.16582	.000	-1.4672	-.6756
ENGPAR	1.00	2.00	.37192	.15920	.056	-.0081	.7519
		3.00	1.51478*	.15920	.000	1.1348	1.8948
	2.00	1.00	-.37192	.15920	.056	-.7519	.0081
		3.00	1.14286*	.16059	.000	.7595	1.5262
	3.00	1.00	-1.51478*	.15920	.000	-1.8948	-1.1348
		2.00	-1.14286*	.16059	.000	-1.5262	-.7595

UBU	1.00	2.00	.10222	.19956	.866	-.3741	.5786
		3.00	1.45936*	.19956	.000	.9830	1.9357
	2.00	1.00	-.10222	.19956	.866	-.5786	.3741
		3.00	1.35714*	.20130	.000	.8766	1.8377
	3.00	1.00	-1.45936*	.19956	.000	-1.9357	-.9830
		2.00	-1.35714*	.20130	.000	-1.8377	-.8766
USH	1.00	2.00	.21305	.21508	.585	-.3003	.7264
		3.00	1.57020*	.21508	.000	1.0568	2.0836
	2.00	1.00	-.21305	.21508	.585	-.7264	.3003
		3.00	1.35714*	.21696	.000	.8393	1.8750
	3.00	1.00	-1.57020*	.21508	.000	-2.0836	-1.0568
		2.00	-1.35714*	.21696	.000	-1.8750	-.8393
LMOT	1.00	2.00	.78325*	.16763	.000	.3831	1.1834
		3.00	1.81897*	.16763	.000	1.4188	2.2191
	2.00	1.00	-.78325*	.16763	.000	-1.1834	-.3831
		3.00	1.03571*	.16910	.000	.6321	1.4394
	3.00	1.00	-1.81897*	.16763	.000	-2.2191	-1.4188
		2.00	-1.03571*	.16910	.000	-1.4394	-.6321
LCON	1.00	2.00	.88547*	.17205	.000	.4748	1.2962
		3.00	1.92118*	.17205	.000	1.5105	2.3319
	2.00	1.00	-.88547*	.17205	.000	-1.2962	-.4748
		3.00	1.03571*	.17356	.000	.6214	1.4500
	3.00	1.00	-1.92118*	.17205	.000	-2.3319	-1.5105
		2.00	-1.03571*	.17356	.000	-1.4500	-.6214
SINTEAC	1.00	2.00	.36946	.17724	.099	-.0536	.7925
		3.00	2.29803*	.17724	.000	1.8750	2.7211
	2.00	1.00	-.36946	.17724	.099	-.7925	.0536
		3.00	1.92857*	.17878	.000	1.5018	2.3553
	3.00	1.00	-2.29803*	.17724	.000	-2.7211	-1.8750
		2.00	-1.92857*	.17878	.000	-2.3553	-1.5018
SINLEA	1.00	2.00	.59360*	.19892	.010	.1188	1.0684
		3.00	2.27217*	.19892	.000	1.7974	2.7470

			Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
	2.00	1.00	-.59360*	.19892	.010	-1.0684	-.1188
		3.00	1.67857*	.20065	.000	1.1996	2.1575
	3.00	1.00	-2.27217*	.19892	.000	-2.7470	-1.7974
		2.00	-1.67857*	.20065	.000	-2.1575	-1.1996
SICLASS	1.00	2.00	.23276	.17183	.370	-.1774	.6429
		3.00	2.48276*	.17183	.000	2.0726	2.8929
	2.00	1.00	-.23276	.17183	.370	-.6429	.1774
		3.00	2.25000*	.17333	.000	1.8363	2.6637
	3.00	1.00	-2.48276*	.17183	.000	-2.8929	-2.0726
		2.00	-2.25000*	.17333	.000	-2.6637	-1.8363
SSDISC	1.00	2.00	.40887	.19121	.088	-.0475	.8653
		3.00	2.73030*	.19121	.000	2.2739	3.1867
	2.00	1.00	-.40887	.19121	.088	-.8653	.0475
		3.00	2.32143*	.19288	.000	1.8610	2.7818
	3.00	1.00	-2.73030*	.19121	.000	-3.1867	-2.2739
		2.00	-2.32143*	.19288	.000	-2.7818	-1.8610
SCLAST	1.00	2.00	.88793*	.17473	.000	.4709	1.3050
		3.00	2.67365*	.17473	.000	2.2566	3.0907
	2.00	1.00	-.88793*	.17473	.000	-1.3050	-.4709
		3.00	1.78571*	.17625	.000	1.3650	2.2064
	3.00	1.00	-2.67365*	.17473	.000	-3.0907	-2.2566
		2.00	-1.78571*	.17625	.000	-2.2064	-1.3650
CEVALC	1.00	2.00	-.20690*	.07542	.020	-.3869	-.0269
		3.00	1.35382*	.07542	.000	1.1738	1.5339
	2.00	1.00	.20690*	.07542	.020	.0269	.3869
		3.00	1.56071*	.07608	.000	1.3791	1.7423
	3.00	1.00	-1.35382*	.07542	.000	-1.5339	-1.1738
		2.00	-1.56071*	.07608	.000	-1.7423	-1.3791
CEVALNCL	1.00	2.00	.15788	.09147	.202	-.0605	.3762
		3.00	1.27217*	.09147	.000	1.0538	1.4905
	2.00	1.00	-.15788	.09147	.202	-.3762	.0605
		3.00	1.11429*	.09227	.000	.8940	1.3345

	3.00	1.00	-1.27217*	.09147	.000	-1.4905	-1.0538
		2.00	-1.11429*	.09227	.000	-1.3345	-.8940
IEVALC	1.00	2.00	-.10542	.06992	.293	-.2723	.0615
		3.00	1.50172*	.06992	.000	1.3348	1.6686
	2.00	1.00	.10542	.06992	.293	-.0615	.2723
		3.00	1.60714*	.07053	.000	1.4388	1.7755
	3.00	1.00	-1.50172*	.06992	.000	-1.6686	-1.3348
		2.00	-1.60714*	.07053	.000	-1.7755	-1.4388
IEVALNC	1.00	2.00	.61207*	.08888	.000	.3999	.8242
		3.00	1.55850*	.08888	.000	1.3463	1.7707
	2.00	1.00	-.61207*	.08888	.000	-.8242	-.3999
		3.00	.94643*	.08966	.000	.7324	1.1604
	3.00	1.00	-1.55850*	.08888	.000	-1.7707	-1.3463
		2.00	-.94643*	.08966	.000	-1.1604	-.7324

 * The mean difference is significant at the 0.05 level.

In terms of the evaluation scores, course and instructor evaluations also revealed differences between faculty groups. Specifically, there were differences between all faculty groups with respect to course evaluations of clickers users. Non-clickers course evaluations differed between full professors (full), and associate and assistant professors. Instructor evaluations of clickers users revealed that full professors differed from associate and assistant professors. For non-clickers instructor evaluations, there were differences between all faculty groups.

Table 3 illustrates the mean differences for the study. The engagement variable has four constructs and the mean for assistant professors was higher for each construct as compared to the other faculty ranks. Following are the mean differences for each construct. For ENGINV the mean for assistants is 4.55, for associates 4.46, and full professors (fulls), 3.39. For ENGATT the mean for assistants is 4.65, for associates 4.46, and fulls, 3.21. For ENGINT the mean for assistants is 4.31, for associates 4.25, and fulls, 3.17. For ENGPAR the mean for assistants is 4.58, for associates 4.21, and fulls, 3.07.

TABLE 3. MEANS

RANK		ENGINV	ENGATT	ENGINT	ENGPAR	UBU	USH	LMOT
1.00	Mean	4.5517	4.6552	4.3103	4.5862	4.1379	4.0345	4.0690
	N	29	29	29	29	29	29	29
	Std. Deviation	.50612	.48373	.60376	.50123	.69303	.82301	.65088

2.00	Mean	4.4643	4.4643	4.2500	4.2143	4.0357	3.8214	3.2857
	N	28	28	28	28	28	28	28
	Std. Deviation	.50787	.50787	.51819	.49868	.79266	.86297	.65868
3.00	Mean	3.3929	3.2143	3.1786	3.0714	2.6786	2.4643	2.2500
	N	28	28	28	28	28	28	28
	Std. Deviation	.68526	.78680	.72283	.76636	.77237	.74447	.58531
Total	Mean	4.1412	4.1176	3.9176	3.9647	3.6235	3.4471	3.2118
	N	85	85	85	85	85	85	85
	Std. Deviation	.77387	.87847	.80492	.87895	.99972	1.06353	.97705

TABLE 3. CONTINUED

RANK		LCON	SINTEAC	SINLEA	SICLASS	SSDISC	SCLAST	CEVALC
1.00	Mean	4.2069	4.6552	4.3793	4.4828	4.5517	4.1379	3.8931
	N	29	29	29	29	29	29	29
	Std. Deviation	.61987	.48373	.62185	.50855	.57235	.78940	.37790
2.00	Mean	3.3214	4.2857	3.7857	4.2500	4.1429	3.2500	4.1000
	N	28	28	28	28	28	28	28
	Std. Deviation	.66964	.65868	.68622	.64550	.75593	.51819	.19626
3.00	Mean	2.2857	2.3571	2.1071	2.0000	1.8214	1.4643	2.5393
	N	28	28	28	28	28	28	28
	Std. Deviation	.65868	.82616	.91649	.76980	.81892	.63725	.24395
Total	Mean	3.2824	3.7765	3.4353	3.5882	3.5176	2.9647	3.5153
	N	85	85	85	85	85	85	85
	Std. Deviation	1.01901	1.20886	1.21936	1.29370	1.40248	1.29511	.74825

TABLE 3. CONTINUED

RANK		CEVALNCL	IEVALC	IEVALNC
1.00	Mean	3.4793	3.9517	3.5621
	N	29	29	29
	Std. Deviation	.40829	.34808	.35296

2.00	Mean	3.3214	4.0571	2.9500
	N	28	28	28
	Std. Deviation	.38907	.16872	.43162
3.00	Mean	2.2071	2.4500	2.0036
	N	28	28	28
	Std. Deviation	.19423	.23960	.16212
Total	Mean	3.0082	3.4918	2.8471
	N	85	85	85
	Std. Deviation	.66300	.78060	.72598

The understanding variable has two constructs. The mean for assistant professors was higher for both constructs. For UBU the mean for assistants was 4.13, for associates, 4.03, and full professors (fulls), 2.67. For USH the mean for assistant professors was 4.03, for associates 3.82, and fulls 2.46. Two constructs assess the learning variable. The mean for assistant professors was higher for both constructs. For LMOT the mean for assistants was 4.06, for associates, 3.28, and fulls, 2.25. For LCON the mean for assistant professors was 4.20, for associates 3.32, and fulls 2.28. The strategy variable has five constructs. The mean for assistant professors was higher for each construct as compared to the other faculty ranks. For SINTEAC the mean for assistants is 4.65, for associates 4.28, and fulls, 2.35. For SINLEA the mean for assistants is 4.37, for associates 3.78, and fulls, 2.10. For SICLASS the mean for assistants is 4.48, for associates 4.25, and fulls, 2.00. For SSDISC the mean for assistants is 4.55, for associates 4.14, and fulls, 1.82. For SCLAST the mean for assistants is 4.13, for associates 3.25, and fulls, 1.46. With respect to course evaluations of clickers users, associate professors had the highest mean (4.10) followed by assistants (3.89) and then fulls (2.53). Mean scores, for course evaluations of non-clickers courses, were highest for assistants (3.47), followed by associates (3.32), and then fulls (2.20).

Upon review of instructor evaluations of clickers users, associate professors had the highest mean (4.05) followed by assistants (3.95) and then fulls (2.45). Mean scores, for instructor evaluations of non-clickers courses, were highest for assistants (3.56), followed by associates (2.95) and then fulls (2.00).

DISCUSSION

The results of the study indicate that instructor attitudes toward clickers vary by faculty rank; course and instructor evaluations of clickers courses were higher than non-clickers courses; and course and instructor evaluations vary by faculty rank. Overall, assistant professors had the most positive attitudes towards clickers as their mean scores were highest for each variable as compared to other faculty groups. Assistant professors clearly feel that clickers facilitate more engagement, understanding, and learning in the classroom. Moreover, they are more favorable toward the use of clickers as a technology strategy as compared to other faculty groups. The findings are consistent with research revealing generational differences with respect to technology.

Upon review of faculty group differences, the greatest variance in attitudes occurred between both assistant and associate professors, and full professors. Assistant and associate professors felt that the clickers technology improved the atmosphere of the class due to increased interaction and student participation. These instructors also found the technology beneficial for students as it could assist their understanding and learning of course material which would enable them to do well on exams. With respect to clickers, as a technology strategy, assistant and associate professors held more favorable attitudes. These faculty members had greater belief that technology enhances interactive teaching and promotes an interactive classroom. Moreover, these instructors are more inclined to shift the class discussion based on clicker results.

All faculty groups varied in their perceptions of the learning variable. It seems that each group held a different attitude about the role of clickers as it relates to the student's motivation to learn and connect ideas. Each faculty group also held different notions of technology strategy as it relates to facilitating interactive learning. Varying perspectives among faculty groups also exist concerning the amount of class time devoted to using clickers.

For the most part, the findings indicate that assistant and associate professors held more similar and favorable attitudes toward clickers as opposed to full professors. Full professors were clearly less favorable toward the technology. Since most full professors are likely part of the Baby-Boomer generation, they may be less inclined to adopt new technology. Their perceptions may be that clickers are difficult to use, waste valuable class time, and they facilitate no real learning. These ideas speak to the notion of relative advantage as discussed by Rodgers (1995). Rodgers asserts that prior to adopting a new technology the user often evaluates the benefit associated with the new technology and whether adoption of the technology is actually useful.

Two particularly interesting results reveal the attitudes of full professors toward using clickers as a technology strategy. First, full professors in the study were overwhelmingly less favorable to using class time to explore clickers based questions. Second, they were less inclined to shift the class discussion based on clickers responses. These reactions may be due, in part, to a required, immediate, and somewhat spontaneous reaction to an unforeseen topic. As such, this activity requires flexibility based on student responses. Subsequently, the professor can't necessarily maintain the fixed agenda for the class session, and ultimately the course. The idea of not covering allotted material may be a source of discomfort which gravely impacts attitudes toward the technology. These sentiments are consistent with the concept of compatibility as developed by Rodgers (1995). In his discussion about compatibility, Rodgers suggests that a potential new technology adopter analyzes how consistent the new technology is in comparison to current approaches. The results of this assessment will contribute to the new technology adoption decision.

With respect to course and instructor evaluations, there were distinct differences. Courses with clickers were viewed more favorably than non-clickers courses. Instructor evaluations of clickers users were higher than their counterparts not using clickers. In terms of faculty group differences, interestingly, associate professors using clickers were evaluated more favorably on both course and instructor evaluations. This finding may be the result of these professors having a combination of academic experience, and facility with the technology. Moreover, assistant professors had the highest evaluations for both course and instructor evaluations for non-clickers

users. Perhaps assistant professors are viewed more positively as they are among the newest additions to the faculty and students may perceive them as a fresh alternative to existing faculty. Another interesting finding is that full professors received the lowest course and instructor evaluations, independent of clicker usage. However, upon clickers usage, both course and instructor scores for full professors improved.

REFERENCES

AACSB International. (2011). *Business School Data Trends & List of Accredited Schools.* 32-35.
Ball, D., Levy, Y. (2008). Emerging educational technology: Assessing the factors that influence instructors' acceptance in information systems and other classrooms. *Journal of Information Systems Education, 19*(4), 431-443.

Beatty, I. (2004). Transforming student learning with classroom communication systems. *EDUCAUSE Center App. Res. Res. Bull.3*, 1-13.

Beekes, W. (2006). The Millionaire Method for Encouraging Participation. *Active Learning Higher Education 7* (1), 25-36.

Brewer, C. (2004). Near real-time assessment of student learning and understanding in biology courses. *Bio-Science 54*(11), 1034-1039.

Burns, R. (1985). *Information impact and factors affecting recall.* National Conference on Teaching Excellence and Conference of Administrators. Austin, TX.

Buzzard, C., Crittenden, V., Crittenden, W., McCarty, P. (2011). The use of digital technologies in the classroom: A teaching and learning perspective. *Journal of Marketing Education 33*(2), 131-139.

Campus Technology. (2009). Students unimpressed with faculty use of Ed tech.

Cauley, F., Aiken, K., &Whitney, L. (2010). Technologies across our curriculum: A study of technology integration in the classroom. *Journal of Education for Business*, 85(2), pp. 114-118.

Chronicle of Higher Education (2010, July 25). Professors' use of technology in teaching.

Copeland, H. (1998). Making the continuing education lecture effective. *Journal of Continuing Education Profession 18*, 227-234.

Crandall, J., Lim, K., Ro, Y. ((2010). The impact of IT: Pedagogical perspectives in university education settings. *Journal of International Business Research, 9*, 23-31.

Crossgrove, K. & Curran, K. (2008). Using clickers in non-majors and majors level biology courses. *CBE Life Sciences Education 7*(1), 146-154.
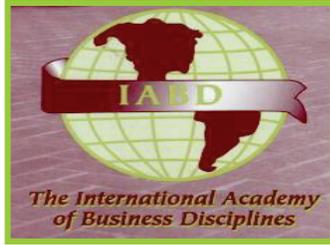
Cue, N. (1998). *A universal learning tool for classrooms.* Proceedings of the First Quality in Teaching and Learning Conference. Hong Kong SAR, China.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, September, 319-339.

Deal, A. (2007). Classroom response systems. *Carnegie Mellon White Paper,* 1-14.

Draper, S. (1998). Niche-based success in CAL. *Computing Education 30*, 5-8.

Draper, S. (2002). *Evaluating effective use of PRS: Results of the evaluation of the use of PRS in Glasgow University.*

Elliot, C. (2003). Using a personal response system in economics teaching. *Int. Rev. Econ. Ed. 1*, 80-86.

Guidry, K., & Lorenz, A. (2010). A comparison of student and faculty academic technology use across disciplines. *EDUCAUSE Quarterly, 33,* 1-12.

Ilacqua, J., Park, E., Gannon, D., Allen, J. (2007). *Fostering an active learning environment through technology.* Proceedings of the Northeast Business & Economics Association. 223-226.

IOMA Law Office Management & Administration Report (November, 2009). *Boomers showing how to use the new web.* Issue 9, 11.

Karahanna, E., Straub, D. W. & Chervany, N. L. (1999). Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, 23 (2), 183-213.

Miller, R. (2003). Evaluation of an audience response system for continuing education of health professionals. *Journal of Continuing Education Health Profession 23*, 109-115.

Nichol, D., Boyle, J. (2003). Peer instruction versus class-wide discussion in large classes: A comparison of two interaction methods in the wired classroom. *Study in Higher Education, 28*(4), 457-473.

Perez, S. (2009). *The technology generation gap at work is oh so wide.* Read Write Archives.

Rodgers, E. (1995). *The diffusion of innovations.* 4th edition, Free Press: New York.

Simpson, V. & Oliver, M. (2006). *Using electronic voting systems in lectures.* www.ucl.ac.uk/learningtechnology/examples/electronicvotingsystems.pdf

Steinert, Y. & Snell, L. (1999). Interactive lecturing: strategies for increasing participation in large group presentations. *Medical Teacher 21,* 37-42.

Stone, B. (January 9, 2010). The children of cyberspace: Old fogies by their 20's. *New York Times*.

Wood, W. (2004). Clickers: A teaching gimmick that works. *Developing Cell 7*(6), 796-798.

Xu, Y., Meyer, K. (2007). Factors explaining faculty technology use and productivity. *Internet and Higher Education, 10*, 41-52.

Zhao, J., Alexander, M., Perreault, H, & Waldman, L. (2007). A longitudinal study of information technology impact on business faculty in distance education. *Delta Pi Epsilon Journal*, *49*(3), 55-68.