Adopting Web 2.0 for Instruction:

The Effects of Faculty Rank and Employment Status

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Abstract

Faculty resistance to technology adoption for instruction has been a persistent and pervasive issue in higher education. Many previous studies have examined psycho-social factors of the slow pace or absence of technology adoption for instruction. This research study aims to examine the impact of faculty status (employment rank and %FTE) on their interest in learning about Web 2.0 technologies (blogs and podcasts) for instruction. It was found that part-time and non-tenured instructors are more interested in consuming and producing Web 2.0 applications than their full-time and tenure counterparts. However, many institutions restrict training and professional development for their full-time faculty, partly due to tightening budgets. This study shows that part-time faculty are early adopters and their failure due to lack of support might have negative impacts on late adopters. Thus, institutions should rethink the existing strategy of guiding technology adoption.

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Faculty resistance to technology adoption for instruction has been a persistent and pervasive issue in higher education. Although approximately 80% of public 4-year colleges have installed and configured course management tools for their faculty members, a 2002 review showed that professors use these resources in only 20% of their courses (Lynch Altschuler & McClure, 2002). As a matter of fact, this phenomenon occurs not only in 4-year public colleges; rather, it is widespread across all US institutions (Moser, 2007). An instructional technologist expressed his frustration with the slow rate of adoption by saying, "The pace of academe is perhaps best measured by the 25 years it took to get the overhead projectors out of the blowing alley and into the classroom" (Gilbert & Green, 1997, p.3; cited in Beggs, 2000). This problem has been intensified with the advance of Web 2.0. Web 2.0 is a trend in World Wide Web technology, a second generation of web-based communities and hosted services that aim to facilitate creativity, collaboration, and sharing among users (i.e. blogs, wikis, podcasts, and social networking sites).

To remediate the problem, institutions employing new educational technologies must make them accessible to encourage faculty adoption. New technologies take time to be introduced, taught, and implemented, and it is important that faculty members are comfortable with this process. Further, new technologies should not be implemented at a rate faster than faculty can effectively adopt them. By considering potential problems with technological innovation from the faculty member's perspective, universities will be better able to employ new technologies while maintaining faculty interest. Without faculty support and interest in

using new technologies, investments in the new tools may not lead to anticipated teaching practices and learning outcomes

Also, if faculty members do not embrace innovative instructional technologies, many students may report being less satisfied with their learning experiences. Prensky (2001) refers to tech-savvy students as “digital natives” who reside in the world of digital technology. Specifically, they participate in social networks, social bookmarking, blogging, and many other Web-based activities. A discrepancy between faculty and students use of Web 2.0 exists. Ajjan and Hartshorne (2008) asserted that faculty perceived Web 2.0 as an undesired interruption of the existing process. On the other hand, students were more supportive to Web 2.0 technologies because their level of comfort with Web 2.0 was high. Slow adoption of Web 2.0 by faculty could eventually lead to loss of communication between faculty and students.

It is expected that not all faculty will support the integration of Web 2.0 technologies similarly. Faculty on the tenure track, who work full-time, may have competing responsibilities. An innovation is more likely to be adopted when it is compatible with the job responsibility and value system of the potential adopter (Tornatzky & Klein, 1982). Traditionally, faculty advance their careers by publishing articles in peer-review journals, making presentations in scholarly conferences, and obtaining grants from funding agencies. Technology adoption for instruction, to most professors, is not a priority. One might argue that student evaluation plays a significant role in their promotion and thus teaching enhancement by technology should be highly relevant. However, as mentioned before, many faculty members might feel that use of Web 2.0 requires an undesired change in their current teaching processes and thus is detrimental to their teaching (Ajjan & Hartshorne, 2008). Not surprisingly, these faculty members may find it difficult to make time to learn new instructional technologies and

may focus their attention instead on research and service. In contrast, part-time, non-tenure track faculty members are hired to teach; therefore, they may be more eager to adopt new technologies aimed at engaging students. This research study aims to examine the impact of faculty status (employment rank and %FTE) on their interest in learning about Web 2.0 technologies (blogs and podcasts) for instruction.

Theoretical framework

According to Hall's (1979) Concern Based Adoption Model (CBAM), teachers play a crucial role in bringing technology into educational applications. However, unlike a top-down approach initiated by administrators, the adoption process is gradual and must concentrate on teachers' concerns. Specifically, the adoption process can be broken down into six stages, as shown in Table 1.

Table 1. The model of stages of concern.

Stage	Name	Description of Concerns
0	Awareness	Teachers have little awareness of a particular innovation.
1	Informational	Teachers have general or vague awareness of an innovation. Teachers may begin some information seeking to gain additional knowledge about the innovation.
2	Personal	Teachers' concerns are about the personal costs of implementing an innovation.
3	Management	Teachers' concerns will focus around how to integrate the logistics of a particular innovation into their daily job.
4	Consequence	Teachers' concerns are primarily on the impact of the innovation on their students.
5	Collaboration	Teachers begin to have concerns about how they compare to their peers, and how they can work with their fellow teachers on an innovation.
6	Refocusing	Teachers' concerns are how to better implement an innovation.

Hall's model stresses the important fact that faculty members cannot fully embrace a

new technology all at once. In a follow-up study, Hall and Hord (1987) suggested three to five year implementation times for innovation. Further, the Apple Classroom of Tomorrow (ACOT) project sponsored by Apple Computer Inc. developed a simpler model of technology implementation than Hall's (Dwyer, Ringstaff, & Sandholtz, 1991). The ACOT model is comprised of only five stages, as shown in Table 2:

Table 2. Apple Computer in the Apple Classroom of Tomorrow's model.

Stage	Name	Description
1	Entry	Instructors struggle to cope with and establish order in the transformed classroom.
2	Adoption	The beginning of adoption into the traditional classroom.
3	Adaptation	While traditional teaching methods still predominate, but now supported with technology.
4	Appropriation	With increasing confidence teachers become confident and pedagogically innovative.
5	Invention	Creativity including active experimentation by teaches and students.

In addition to Halls' model and ACOT's model, there are many other conceptual frameworks describing different stages of technology adoption in education. Farquhar and Surry (1994) asserted that these various models are useful because knowing the central issues affecting adoption can be helpful to increase the utilization of the innovation. Although, it is beyond the scope of this article to introduce all technology adoption models, interested readers are encouraged to consult Baltaci-Goktalay and Ocak (2006) and Sahin (2005) for more information. The purpose of illustrating the preceding 1979 model and 1991 model is to show that these once widely accepted models may be inadequate in dealing with today's technologies.

The 2007 Horizon Report highlights the fact that Web 2.0 technologies that allow Web users to move from being passive recipients (consumers) to active creators (producers) are

becoming pervasive (New Media Consortium, 2007). Hence, it is no longer adequate to view the technology adoption process in a pure "consumer" perspective. Also, Web 2.0 technologies are not just "educational" technologies for use in the classroom; instead these technologies are ubiquitous, influencing many elements of one's life. In other words. In the ACOT model, Stage 2 is the beginning of adoption into the classroom, but the model does not suggest a transition or overlapping between personal use and educational applications of technology. Today resistance to use technologies in personal life might also be associated with resistance to use technologies for instruction. Thus, our challenge as educational researchers is to determine how new technologies, such as Web 2.0, will impact teaching and learning. The focus of this study is faculty interest in using blogs and podcasts. The research team conceptualizes the gradual adoption process, as shown in Table 3:

Table 3. Consumer-producer model.

Stage	Name	Description
0	Awareness	Instructors are aware of the availability of the new technologies.
1	informational	Instructors gather information about the new technologies.
2	Consumption for personal use	Instructors use the new technologies as consumers in their personal life (e.g. reading non-academic blogs and wikis, and listening to podcasts).
3	Consumption for teaching or/and research	Instructors use the new technologies as consumers in teaching or/and research (e.g. using wikipedia for references).
4	Production	Instructors use the new technologies as producers in teaching or/and research (e.g. recording lectures in podcasts and coauthoring papers by wikis).

Research on faculty technology use has shown that computer competency and previous

computer training courses are strong predictors of faculty use of computers for instruction (Dusick & Yildirim, 2000). Subsequently, computer knowledge influences self-efficacy with regard to adoption of new technology (Gong, Xu, & Yu, 2004; Teo, 2009). Prior research revealed that fear of failure in using new technology is a critical factor contributing to faculty resistance. It is embarrassing for faculty members to expose their lack of technological skills in front of their students and colleagues (Beggs, 2000; Hannafin & Savenye, 1993). In addition, other studies indicate the importance of social factors in technology adoption and diffusion, such as peer groups, role models, and social networks. It was suggested that faculty prefer to learn about technology from friends who are accessible rather than by reading the manuals on their own (Hall & Elliott, 2003; Roberts, Kelley, & Medlin, 2007). While informal influences such as role modeling and social networking are tied to technology diffusion, formal and structured influences, including institutional support, should not be overlooked. Henderson and Dancy (2006) found that educational researchers expect to deploy curricular innovations and have faculty adopt them immediately, while faculty expect to receive support from researchers to customize the technology for their specific instructional environments. Further, convenience also plays a crucial role. Both faculty and students tend to embrace technological resources that are perceived as convenient, relevant, and time saving. In other words, a steep learning curve or poor user interface becomes a major hindrance (Harvel, 2006). This idea was formalized in the Technology Acceptance Model (Davis, 1989, 1993), in which perceived usefulness and perceived ease of use were taken into account.

Faculty status is also important to this discussion. Dusick and Yildirim (2000) found that 72 percent of full-time faculty reported using computers for instruction, compared to 92 percent for part-time faculty. Part-time faculty may be expected to use classroom technologies,

but they are largely untrained in these areas (Goldberg, Blocher, & Tu, 2008). In addition, many full-time faculty report that they don't have time to attend technology trainings, given their teaching, research, and publishing requirements (Marx, 2005). While self-efficacy, social factors and user interface have been thoroughly studied, the relationship between faculty employment status and technology adoption is relatively under-explored. Thus, this paper will focus on the latter factor.

Data source

The ASU Spring 2007 Faculty Technology survey consisted of 211 closed-ended and 11 open-ended items organized by six sections: 1) Experience with Technology, 2) Teaching Internet, Hybrid & Web-enhanced Courses; 3) Innovative Curriculum; 4) Disaster Planning - Continuing Instruction; 5) Assessing Student Learning with Technology, and 6) Background Information. Data were collected using an online survey administered between April 17, 2007 and April 27, 2007 to 4,370 faculty members. For this study, "faculty" were defined to be anyone serving in a "teaching" role during the spring 2007 semester. Overall, 1,846 faculty completed the survey--a 42% response rate. Individuals with questions or concerns about the study were prompted to email an internal address. Survey participants who emailed the research team received a prompt, personalized response. This strategy of personalized interactions with potential non-responders is known to improve response rates (Cook, Heath, & Thompson, 2000; Dillman, Tortora, & Bowker, 1998).

Method

Since Web 2.0 technologies are a fairly new phenomenon, this study uses data visualization with an exploratory character as the primary analytical tool. In addition to t-tests, this study employs box plots and diamond plots, which are available in JMP (SAS Institute,

2007), to examine how the following variables differ with respect to two grouping factors, rank (tenure vs. non-tenure) and employment status (full-time vs. part-time):

- Interest in authoring blogs (production)
- Interest in reading blogs (consumption)
- Interest in producing podcasts (production)
- Interest in listening to podcasts (consumption)

A diamond plot can be treated as a visual equivalence to a t-test or ANOVA. However, it utilizes confidence intervals (CI) instead of point-estimates. By using CI, the researcher not only looks at the group differences by means, but also by variability. Interpretation of a diamond plot will be illustrated in the results section. Payton, Greenstone and Schenker (2003) warned researchers that inferring from non-overlapping CIs to significant mean differences is a dangerous practice because the error rate associated with this comparison is quite large. The probability of overlap is a function of the standard error. As the standard errors become less homogeneous, the probability of overlap decreases. Simulation results showed that when the standard errors are approximately equal, using 83% or 84% size for the intervals will give an approximate alpha = 0.05 test, but using 95% confidence intervals, which is a common practice, will give very conservative results. In short, diamond plots should be taken for exploratory purposes only; they should not be used as a replacement for hypothesis testing.

Results

Table 4 presents the t-test results of interest in various Web 2.0 technologies by rank and employment status, respectively. It is noteworthy some t-tests are based on pooled variances while others are Satterwaite t-tests. Type of t-tests employed depends on whether the assumption of equal variances is violated. If this parametric assumption is not met, Satterwaite

t-tests should be used.

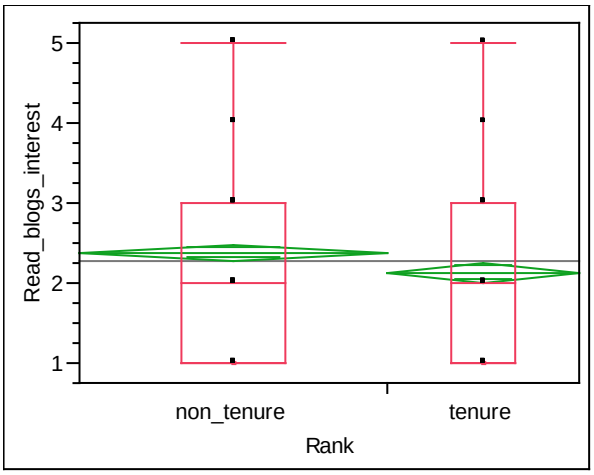
Table 4. T-test results of interest in various Web 2.0 technologies by rank and employment status.

Grouping factors	Dependent variable	Method	Variances	DF	t Value	*Pr* > |t|
Rank	Interest in authoring blogs	Pooled	Equal	*871*	*2.02*	*0.0435**
	Interest reading blogs	Satterthwaite	Unequal	*769*	*3.25*	*0.0012**
	Interest in producing podcast	Pooled	Equal	*850*	*0.27*	*0.7878*
	Interest in listening to podcast	Pooled	Equal	*848*	*2.27*	*0.0234**
Employment	Interest in authoring blogs	Pooled	Equal	*535*	*-3.24*	*0.0013**
	Interest reading blogs	Pooled	Equal	*535*	*-3.51*	*0.0005**
	Interest in producing podcast	Pooled	Equal	*518*	*-2.13*	*0.0340**
	Interest in listening to podcast	Pooled	Equal	521	-2.65	0.0083*

* significance

To identify the data pattern, the research team turned to data visualization. Interestingly, among the four dependent variables, the production-oriented interest items (producing blogs and podcasts) do not show a rank effect while the consumption-oriented interest items (read blogs and listen to podcast) do yield a rank difference (see Figures 1 & 2).

Figure 1. Diamond plots of interest in reading blogs by rank

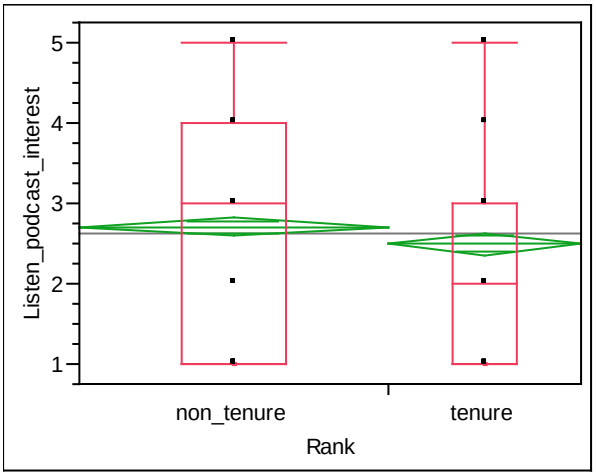


The preceding diamond plot can be interpreted in the following fashion:

- Grand sample mean: represented by a horizontal gray line
- Group means: the horizontal line inside each diamond is the group mean.
- Confidence intervals: The diamond is the CI for each group

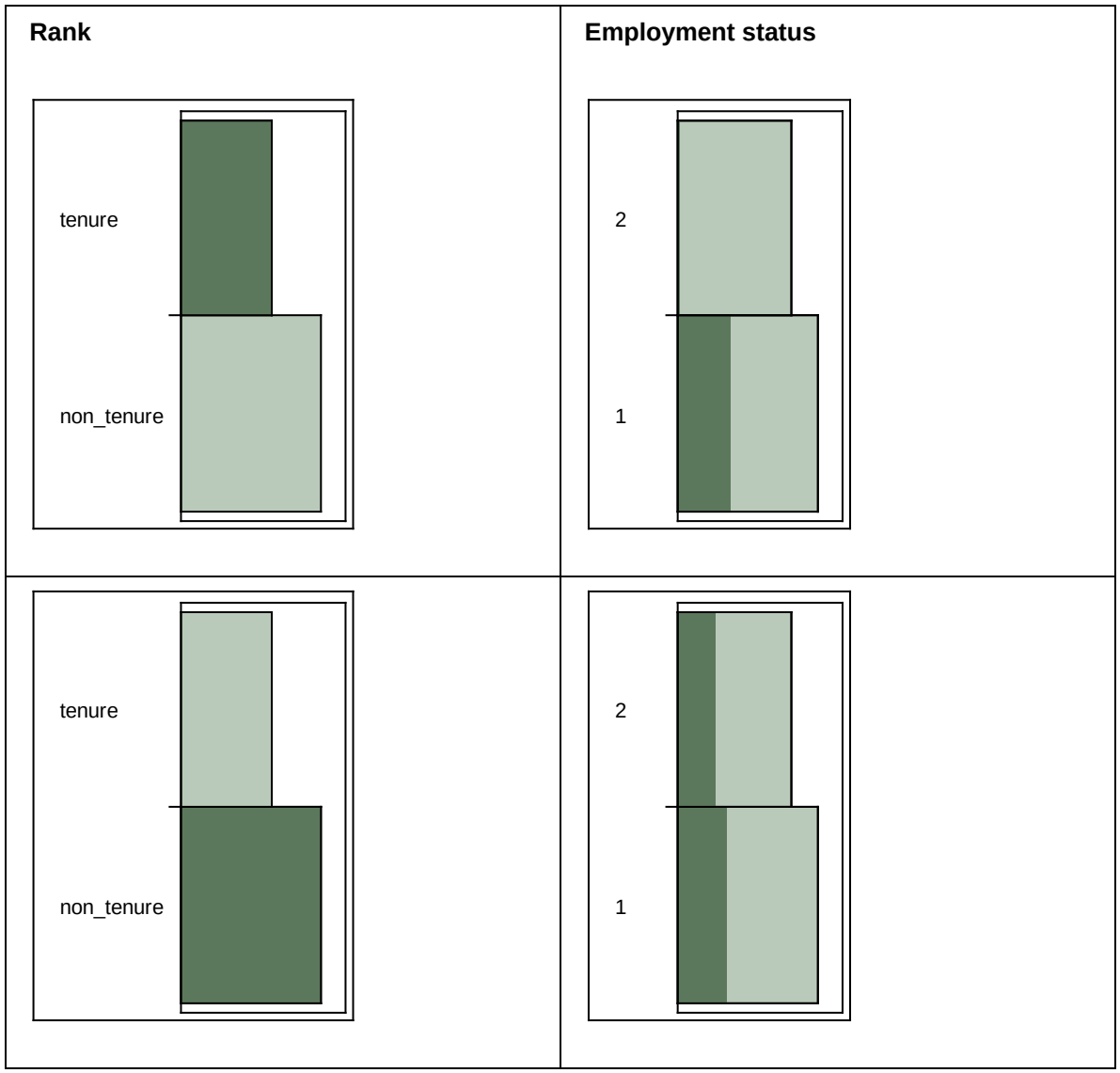
The flatter the diamond, the tighter the CI. If the diamonds do not overlap, a significant group difference is suggested. In this comparison, it is obvious that the upper CI bound of tenure faculty in terms of interest in reading blogs, an example of Web 2.0 consumption, could not reach even the lowest bound of non-tenure faculty. Similarly, Figure 2 indicates that non-tenure faculty members are more interested in listening to podcasts than their tenure counterparts.

Figure 2. Diamond plots of interest in listening to podcast by rank.



After viewing the rank effect diamond plots, the initial conjecture was that non-tenure faculty, likely younger instructors, are more interested in "consuming" new technologies than their senior associates. However, it is important to consider that another variable may be lurking behind the rank effect, namely, employment status. Figure 3 illustrates that all tenured faculty members are full-time employees while a large number of non-tenure faculty are part-time employees (e.g. faculty associate, adjunct professors, lecturers, etc...). The darker area of the upper left panel indicates tenure faculty members. The corresponding observations are highlighted at the upper right panel. It is clear that all tenure faculty members are full-time employees (1 = full-time). The darker area of the lower left panel shows non-tenure instructors. By the same token, these observations are also darkened at the lower right panel. Unlike tenure faculty, non-tenure instructors include both full-time and part-time workers.

Figure 3. Distributions by rank and employment status.

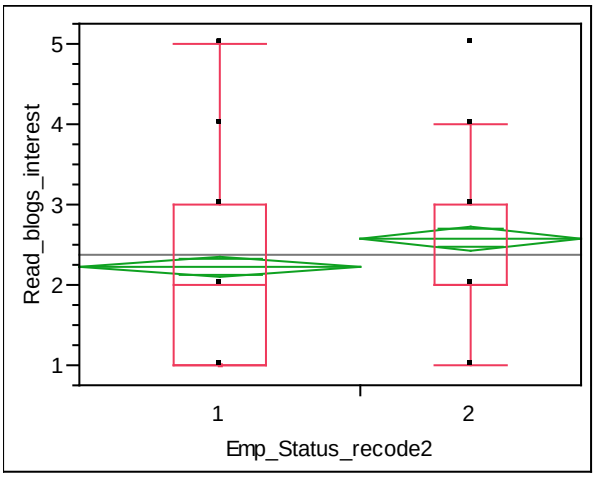


Legend: Employment status: 1 = Full time; 2=Part-time

To further investigate how rank and employment affect interests in Web 2.0 technologies, the subset of non-tenure faculty was extracted and the relationship between the dependent variables and employment status were examined by diamond plots again. The following diamond plots (see Figures 4 and 5) show a substantive gap between full-time and part-time employees with regard to their interest in "consuming" Web 2.0 technologies (i.e. reading blogs and listening to podcasts). A large proportion of non-tenure instructors are part-time employees, and

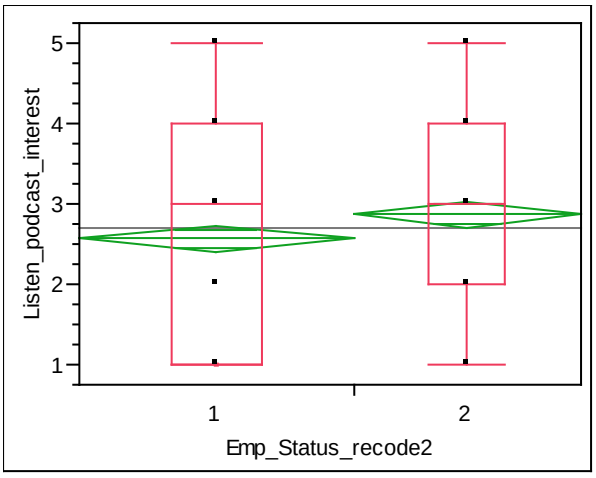
thus it is very plausible that indeed the intense interest in Web 2.0 technologies is tied to faculty employment status instead of faculty rank.

Figure 4. Diamond plots of interest in reading blogs by employment status among non-tenured faculty members.



Legend: 1= Full-time; 2=Part-time

Figure 5. Diamond plots of interest in listening to podcast by employment status among non-tenured faculty members.



Legend: 1= Full-time; 2=Part-time

Discussion and implications

There are several plausible explanations to these findings. One possibility is that part-time employees are not burdened with research and administrative work; therefore, they have more time for experimenting with new educational technologies. Our analysis illustrates this pattern, but cannot explain why it happened. There could likely be more than one explanation. First, part-time employees include a spectrum of different people: faculty associates, lecturers, and graduate assistants. Different types of instructors may have different motivations for adopting technology. Second, the same person might even have more than one reason to adopt technology. Focus-groups and in-depth interviews of part-time instructors will be considered for unveiling the issue.

Also important is that neither tenure nor non-tenure faculty, and neither full-time nor part-time instructors, expressed a high degree of interest in producing podcasts or blogs; thus confirming the research team's belief that technology adoption follows the path from awareness to passive consumption, and active production comes last. The implication for policy-making is that the initial promotion of technology use should not emphasize the production component, especially if the faculty support infrastructure is lacking.

As mentioned before, new technologies, such as Web 2.0, did not originate from educators. They have been embraced by students as a part of their everyday life. Non-tenure and part-time instructors might be experimenting with how to transform their personal use of Web 2.0 into instructional applications. It is important for institutions to devote efforts in guiding this transition and transformation. Many institutions restrict training and professional development for their full-time faculty, partly due to tightening budgets. However, this study shows that part-

time faculty members are early adopters who might be more interested in using the Web 2.0 technologies for instruction.

As cited before, some faculty members would like to learn about technology from friends who are accessible (Hall & Elliot, 2003; Roberts, Kelley, & Medlin, 2007). Moser (2007) warned that if proper and sufficient support is not available to early adopters, their efforts may result in only mediocre quality. And if early adopters experience too many problems with instructional technology, these counter-examples may reinforce resistance among skeptics. Interestingly enough, Ajjan and Hartshorne (2008) found that while some faculty members feel that some Web 2.0 technologies could improve students' learning, their interaction with faculty and with other peers, their writing abilities, and their satisfaction with the course, very few choose to adopt them in the classroom. It doesn't necessarily mean that those survey participants were inconsistent or that they merely tried to "look good" by affirming the value of instructional technology. Perhaps their so-called "resistance" should not be equated with "rejection." Rather, most faculty members adopt a "wait and see" attitude by letting early adopters be the beta testers responsible for fixing all the bugs. Thus, training should not necessarily be limited to full-time faculty; rather, it should be extended to part-time instructors who will set examples to other potential adopters.

More important is the digital divide between instructors and students. Generally speaking, students are more tech-savvy than their instructors and as a result, instructors are challenged to catch up (McGee & Diaz, 2007). In short, it is no sufficient for instructors to express interest and merely become consumers of the same technologies that interest their students. Instead, students expect curriculum to be packaged using new digital media produced by their instructors. To fill this gap, it is recommended that institutional support, coordination,

and training should be developed for all faculty. Currently most technology implementation strategies target full-time faculty and the potential of part-time instructors goes unrealized. Future studies will be conducted to formulate a specific plan to support all faculty in their adoption of web 2.0 technologies for instruction.

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