Predicting the Probability for Adopting an Audience Response System in Higher Education

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Abstract

Instructional technologies can be effective tools to foster student engagement, but university faculty may be reluctant to integrate innovative and evidence-based modern learning technologies into instruction. It is important to identify the factors that influence faculty adoption of instructional technologies in the teaching and learning process.

Based on **Rogers' diffusion of innovation theory**, this quantitative, nonexperimental, one-shot survey determined what attributes of innovation (relative advantage, compatibility, complexity, trialability, and observability) predict the probability of faculty adopting the **audience response system (ARS)** into instruction. The sample for the study consisted of 201 faculty who have current teaching appointments at a university in the southeastern United States. Binary logistic regression analysis was used to determine the attributes of innovation that predict the probability of faculty adopting the ARS into instruction.

The data indicated that the attributes of compatibility and trialability significantly predicted faculty adoption of ARS into instruction.

Problem

At a university in the southeastern United States, the faculty were reluctant and resistant to adopt instructional technology, such as the ARS. Although the university promoted the use of various types of instructional technology and offered faculty training and support for their adoption, few faculty members utilized the devices. The usage data revealed the **current adoption rate for ARS** at the university was only about 25%, which was **unexpectedly low**.

Purpose

The purpose of the study was to determine what attributes (relative advantage, compatibility, complexity, trialability, and observability) of Rogers' Diffusion of Innovation Theory predict the probability of faculty adopting the ARS into instruction.

Relevant Literature

Tamim et al. (2011) conducted a second-order meta-analysis, which brought together more than 40 years of research evidence on the effects of technology in classrooms on student achievement. The results of the **studies revealed significant affirmative effects on student's achievement favoring the utilization of instructional technology over traditional instructional methods.**

Concomitant with the evidence about the potential benefits of incorporating technology is a **paradigm shift** from viewing learners as passive recipients of information to understanding them as self-regulated active participants in the construction of knowledge (Knowles, Holton, Swanson, 2011; Lai et al., 2013; Schunk, 2012). When used appropriately, instructional technology can support this paradigm shift (Renes & Strange, 2011).

In addition, there is substantial evidence to suggest that higher education **students are very positive toward the use of ARSs** (Fies & Marshall, 2006; Guse & Zobitz, 2011; Kay & LeSage, 2009a; Oigara & Keengwe, 2013; Simpson & Oliver, 2007; Vaterlans, Beckert, Fauth, & Teemant, 2012).

Research Question

What attributes of innovation (*relative advantage, compatibility, complexity, trialability, and observability*) **predict the probability of faculty adopting ARS into instruction?**

Procedures

A pre-established survey instrument, created by Moore and Benbasat (1991) for a similar inquiry in a different context, formed the basis of the survey instrument for this study. **Minor modifications were made to the instrument to reflect the purpose of the current study.** A pilot test was conducted to verify the instrument's face and content validity. The participants completed the instrument on the **SurveyMonkey** regarding their present perception of the theoretical innovation attributes, and linked these to their propensity of adopting ARS into instruction.

Data Analysis

Because the instrument used in this study included a mixture of positively-keyed and negatively-keyed questions, **the negatively-keyed items were reverse-coded** before computing the composite scores that represent each attribute.

An **Exploratory factor analysis was conducted** to determine if the items on the survey were loaded on the correct factors.

A **Binary logistic regression analysis** was then conducted to determine the attributes of innovation that predict the probability of faculty adopting the ARS into instruction.

Findings

Exploratory factor analysis on the data revealed that the items on the survey were generally loaded on the correct factors; therefore, **the instrument retained its construct validity despite the minor modifications.**

The test of the full binary logistic regression model, which includes all five predictor variables against a constant only model, was statistically significant, $X^2(5) = 80.544$, $p < .001$), indicating that **the model is a good fit and fairly well predictive of the data.**

The computation revealed that **compatibility** ($p = .023$) and **trialability** ($p = .005$) were statistically significant variables to predict the adoption of ARS into instruction.

The odds ratio Exp(B) for **compatibility** (2.45) predicts that as faculty's perception of compatibility of ARS increases one unit, the odds of adoption increases by 2.5 times.

The odds ratio for **trialability** (1.57) predicts that as faculty's perception of trialability increases one unit, the odds of adoption increases by 1.6 times.

Binary Logistic Regression Analysis of Innovation Diffusion Model Attributes Based on the Respondents' Adoption Decisions

	B	S.E.	Wald	*df*	*p*	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Relative Advantage	.356	.384	.859	1	.354	1.427	.673	3.028
Compatibility	.895	.393	5.185	1	**.023***	**2.447**	1.133	5.285
Complexity	-.270	.255	1.119	1	.290	.764	.463	1.259
Observability	-.154	.312	.243	1	.622	0.857	.465	1.580
Trialability	.452	.161	7.859	1	**.005***	**1.572**	1.146	2.156

Note. The binary dependent variable in this analysis is the answer (yes or no) to the survey question: At this time, do you consider yourself an adopter of the ARS? *$p < .05$

Limitations

One limitation was that **only one type of technology innovation was investigated**. Future research could be undertaken to investigate whether the predictive properties of the five attributes of innovation vary with different types of innovation.

Another limitation is the potential **generalizability** of the findings, because only the population of teaching faculty at one local university was studied.

Conclusions

The findings suggest that faculty need to be given the opportunity to pre-test the ARS prior to implementation. **The greater the opportunity to try a new technology, the easier it is for the faculty to evaluate it and ultimately adopt it.**

In addition, the perception of compatibility of ARS with existing instructional materials was considered an important factor affecting adoption as well. Compatibility is the degree to which the faculty perceives an innovation as being consistent with their existing values, needs, and experiences. **The faculty needs to know how the technology will assist them in achieving their pedagogical goals.**

Social Change Implications

The implication for social change at the local level is to bring an understanding of the factors that influence the faculty's adoption of ARS in the teaching and learning process. Providing evidence-based training and supporting the transfer of learning are the first steps to the successful adoption of ARS in instruction.

In addition, this study is also instrumental in promoting positive social change by fostering evidence-based teaching strategies and innovations that maximize student learning, which include the best practices in leveraging the strengths of ARS.

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