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Examining eXtension: Diffusion, Disruption, and Adoption Among Iowa State University Extension and Outreach Professionals

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Abstract

As eXtension unveils its new membership model, Iowa State University Extension and Outreach must determine how best to support professionals and clientele using the technology. This article reports on a study that used the diffusion of innovations and disruptive innovation theories to assess Iowa Extension professionals' adoption and perceptions of eXtension. One quarter of Iowa Extension professionals had no knowledge of eXtension, and 25% of respondents reported using the technology. Respondents perceived that eXtension exhibits a relative advantage and some of the attributes—accessibility and capacity—needed to become a disruptive innovation. These findings provide a basis for studying disruptive innovations in Cooperative Extension.

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Introduction

Iowa State University Extension and Outreach has been providing research-based education for more than a century. The widespread proliferation of Internet technologies has provided new opportunities to disseminate educational outreach in an online environment. Cooperative Extension has been working to broaden its engagement and efficiency to create an Extension system that uses more online learning technologies to supplement Extension's supply-oriented outreach with a demand-oriented system that delivers content anytime and anyplace (King & Boehlje, 2000).

eXtension is one technology that provides a greater online presence for Cooperative Extension. The National eXtension Initiative is an online Cooperative Extension resource that combines the efforts of land-grant institutions to provide access to research-based, peer-reviewed resources developed by U.S. Extension professionals (eXtension, 2014).

Since the official launch of www.eXtension.org in 2008, professionals and clientele have not adopted and used the online technology to the extent envisioned by eXtension founders (Kelsey, Stafne, & Greer, 2011). Extension professionals' acceptance or rejection of the influx of new technologies, particularly eXtension, over the last decade has yet to be examined in Iowa. Understanding how Extension professionals in Iowa and across the United States adopt and perceive eXtension is key to providing an online learning environment that is relevant, engaging, and valuable.

Theoretical Framework

The diffusion of innovations theory (Rogers, 2003) and disruptive innovation theory (Christensen, 1997) provide a theoretical framework to assess Iowa State University Extension and Outreach professionals' perceptions and acceptance of eXtension. In the study reported here, Rogers's diffusion of innovations theory was used to determine respondents' current stage in the innovation-decision process: no knowledge, knowledge, persuasion, decision, implementation, or confirmation (Rogers, 2003; Li, 2004). Rogers's theory was also used to assess Extension professionals' perceptions of the innovation's attributes: relative advantage, compatibility, complexity, observability, and trialability.

Previous research on eXtension revealed that the technology had not been adopted as founders intended, so the study discussed here used Christensen's (1997) disruptive innovation theory to assess whether the technology is now perceived to have the attributes necessary to create new value for Cooperative Extension. These attributes include affordability, accessibility, capacity, responsiveness, and customization (Christensen, 1997; Christensen, Anthony, & Roth, 2004; Franz & Cox, 2012).

Purpose and Methodology

The purpose of the study was to determine Iowa State University Extension and Outreach professionals' stages of adoption and their perceptions of eXtension using Rogers's (2003) diffusion of innovations theory and Christensen's (1997) disruptive innovation theory. A cross-sectional research design was used to collect perception-based data.

The target population for this census survey was 975 Iowa Extension professionals identified in the 2014 Iowa State University Extension and Outreach employee directory. The survey instrument was based on previous research by Wells (2009), Harder (2007), and Moore and Benbasat (1991). The online questionnaire contained four sections: (a) stage in the innovation-decision process, (b) perceived characteristics of eXtension based on the diffusion of innovations theory, (c) perceived characteristics of eXtension based on the disruptive innovation theory, and (d) background characteristics of Iowa Extension professionals. The survey instrument consisted of Likert scale and Likert-type opinion ratings to assess respondents' perceptions of eXtension. The diffusion of innovations theory characteristics—relative advantage, compatibility, complexity, observability, and trialability—were used to develop Likert scale statements (Rogers, 2003). The disruptive innovation characteristics affordability, accessibility, capacity, responsiveness, and customization served as the constructs for the Likert-type statements (Christensen, 1997; Christensen et al., 2004; Franz & Cox, 2012). The 5-point Likert scale opinion ratings (1 = *strongly disagree,* 2 = *disagree,* 3 = *neither agree nor disagree,* 4 = *agree*, 5 = *strongly agree*) were interpreted in the analysis of the study as being negatively perceived (score of 1.0–2.49), neutrally perceived (2.5–3.5), and positively perceived (3.51–5.0).

In an attempt to control measurement error as a threat to internal validity, a panel of experts recognized for their contributions to understanding the usage and delivery of online technologies among Extension professionals was enlisted to review the questionnaire for content and construct validity. The panel concluded that the questionnaire was content and construct valid. To test for suitability and face validity, a group of five graduate students completed the questionnaire. The students found the questionnaire to be face valid and suitable for the target population. On the basis of recommendations from the panel and students, further clarifying information was added to the questionnaire introduction.

Reliability of the survey instrument was assessed through a pilot study with a randomized subsample of the population (n = 30) (Dillman, Smyth, & Christian, 2009). There were 17 Iowa Extension professionals who

completed the pilot study, for a total response rate of 59%. Cronbach's alpha coefficients were calculated for each Likert scale to measure internal consistency (Moran, Hawkes, & El Gayar, 2010). The alpha coefficients ranged from .62 to .91, indicating that the Cronbach's alpha tests for the pilot and formal studies were reliable (≥ .70) (Santos, 1999).

Qualtrics software was used to distribute and collect survey data. The survey was disseminated using the tailored design method (Dillman et al., 2009). The study population (N = 975) received five contacts. Twenty-one questionnaires were discarded due to a large amount of missing data, which decreased the number of available responses to 429. The final response rate was 44% (n = 429), including respondents from the pilot study.

The no knowledge stage in the innovation-decision process was not included in the statistical analysis because respondents indicating "no knowledge" were not asked to complete questions regarding their perceptions of eXtension. Instead, they were directed to the end of the survey to provide information about their background characteristics.

Descriptive and inferential statistics were calculated using Stata/IC 12 statistical software. Early survey respondents (first 2 weeks, n = 350) were compared to late respondents (last 2 weeks, n = 79) in an attempt to control for nonresponse error and to enhance external validity of the study (Miller & Smith, 1983). This comparison involved 17 variables, including respondents' stages of adoption and perceptions of eXtension, and background characteristics. The comparison suggested that results were generalizable to the entire survey population with the exception of the education variable. There was a statistically significant difference (p = .02, p < .05) found between Iowa Extension professionals' educational attainment; early respondents were more likely to have attained a higher level of education than late respondents.

Findings

One quarter of respondents had no knowledge of eXtension (n = 109, 25.59%), whereas 16% (n = 68) understood the purpose of eXtension (knowledge stage). The highest number of respondents (n = 139, 32.63%) reported that they were familiar with eXtension—the third stage of adoption. Less than 1% of respondents (n = 3) were at the decision stage, 15% (n = 65) were at the implementation stage, and 10% (n = 42) were at the highest stage—confirmation. Table 1 shows the frequencies and percentages of respondents' stages in terms of Rogers's (2003) innovation-decision process.

Table 1.

Distribution of Iowa Extension Professionals' Stages in the Innovation-Decision Process (N = 426)

Stage	Statement	*f*	%	% (cumulative)
No knowledge	I have never heard of eXtension prior to this study.	109	25.59	25.59
Knowledge	I understand the purpose of eXtension, but have not decided if I like the online technology.	68	15.96	41.55
Persuasion	I am familiar with eXtension.	139	32.63	74.18

Decision	I have decided if I will use eXtension.	3	.70	74.88
Implementation	I am using eXtension in my work.	65	15.26	90.14
Confirmation	I have used eXtension long enough to evaluate if the online tool will be part of my future work in Extension.	42	9.86	100.00

Table 2 provides the mean and standard deviation for each of the Likert scale diffusion of innovations attributes. Iowa Extension professionals perceived that eXtension provides a relative advantage to the organization. Yet respondents neither agreed nor disagreed that eXtension exhibits compatibility, complexity, observability, or trialability.

Table 2.

Iowa Extension Professionals' Perceptions of Diffusion of Innovations Attributes of eXtension

Attribute	**Statement example**	***n***	***M*[a]**	***SD***
Relative advantage	eXtension enhances the quality of work I do.	300	3.54	.75
Compatibility	eXtension supports my work.	298	3.47	.76
Complexity	Using eXtension is easy for me.	297	3.44	.68
Observability	I have seen other Extension professionals use eXtension in their work.	290	2.60	.74
Trialability	I am able to experiment with eXtension.	298	2.76	.79

[a]1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*.

Results of the Likert-type statements indicate that Iowa Extension professionals perceived eXtension to exhibit two disruptive innovation attributes: accessibility and capacity (Table 3). Yet respondents neither agreed nor disagreed that eXtension is an affordable, responsive, or customizable technology.

Table 3.

Iowa Extension Professionals' Perceptions of Disruptive Innovation Attributes of eXtension

				Percentage				
Attribute	**Statement**	***n***	**Median[a]**	**SD**	**D**	**NA/D**	**A**	**SA**
Affordability	eXtension is an affordable online technology.	284	3	2	6	44	38	9
Accessibility	eXtension is accessible to all	286	4	5	13	32	42	9

	Iowa Extension professionals.							
Capacity	eXtension builds the capacity of Iowa State University Extension and Outreach.	285	4	4	6	32	50	9
Responsiveness	eXtension is responsive to the technological and information needs of Iowa State University Extension and Outreach.	286	3	3	7	54	31	5
Customization	eXtension can be customized to best meet the needs of Iowa State University Extension and Outreach.	287	3	2	5	64	26	3

[a]1 = *strongly disagree* (SD), 2 = *disagree* (D), 3 = *neither agree nor disagree* (NA/D), 4 = *agree* (A), 5 = *strongly agree* (SA).

Correlational statistics were used to measure the associations between respondents' background characteristics (age, gender, education, and years of employment in Extension) and their perceptions of eXtension. There were statistically significant relationships between respondents' age (r = .19, p < .01), educational attainment (r_S = .12, p < .05), and years of employment (r = .16, p < .01) and their perception of eXtension's trialability (diffusion of innovations attribute). There were no statistically significant relationships between respondents' background characteristics and their perceptions of eXtension's disruptive innovation attributes.

Results of a logistic regression analysis demonstrated that the complexity, trialability, and customization attributes had a statistically significant influence on predicting the likeliness of attaining a higher adoption level of eXtension. For every one-unit increase (1 = *strongly disagree,* 5 = *strongly agree*) in perceived complexity and trialability, the odds of respondents indicating the higher adoption level increased by a factor of 2.5 and 4.3, respectively. For every one-unit increase in perceived customization, respondents were .51 times less likely to select the higher adoption level.

Conclusions

When eXtension was established in 2008, founders envisioned that Cooperative Extension professionals would adopt at a rate of 75% within the first year (Harder & Lindner, 2008). eXtension continues to be far from gaining widespread adoption in Iowa, considering that 25% (n = 109) of the surveyed Iowa Extension

professionals remain at the no knowledge stage. These findings are consistent with previous research that assessed the rate of eXtension's adoption in other state Extension systems (Harder, 2007; Harder & Lindner, 2008; Kelsey et al., 2011; Xu & Kelsey, 2012).

The study reported here provides a basis for determining whether eXtension has the qualities needed to become a disruptive innovation for Cooperative Extension. Although Christensen's (1997) theory was designed to assess how disruptive innovation can be created and nurtured in businesses, it has significant application to Cooperative Extension.

eXtension was conceived as a way to create new value for Cooperative Extension professionals and clientele by providing accessible, research-based information that builds the organization's capacity and outreach. Additional focus on creating new market disruptions to reach those who do not currently use eXtension will aid in increasing the likelihood that eXtension will become a disruptive innovation. Considering that 25% of Iowa Extension professionals have no knowledge of the technology (they are *nonconsumers*, in Christensen's [1997] terms), there is a prime opportunity to educate about the value of eXtension.

As respondents' age, educational attainment, and years of employment in Cooperative Extension increased, their perceptions of the ability to experiment with eXtension (trialability) also became more favorable. These findings indicate that Iowa Extension professionals who are older, are more experienced, and have attained higher levels of education may have had more opportunities to experiment with the resources available within eXtension compared with younger, less experienced, and less educated professionals.

The complexity, trialability, and customization attributes had a statistically significant influence on predicting the likelihood of attaining a higher level of adoption of eXtension. The favorable perceptions of eXtension's complexity align with current research on Extension, which shows that professionals who find online learning technologies easy to use are more likely to adopt them in their work (Dromgoole & Boleman, 2006). In addition, Iowa Extension professionals who had the opportunity to experiment with eXtension (trialability) were more likely to attain a higher stage of adoption in the innovation-decision process.

Respondents' perceptions of eXtension's customization had a negative association with stage of adoption. This could be the result Iowa Extension professionals recognizing that increased customization could potentially result in a loss of continuity and quality when services become too specific to each individual eXtension user.

The diffusion of innovations and disruptive innovation theoretical attributes explained only a small portion of the variance in predicting the level of adoption. The majority of the variance in eXtension adoption was due to other factors not accounted for in the study discussed here.

Recommendations

Further mixed-methods research is needed to

- understand Iowa Extension professionals' lack of awareness of eXtension and determine why so many have not advanced past the decision stage of adoption;
- assess other online learning technologies, such as the Iowa University Extension and Outreach website and social media sites, to determine whether the rate of adoption and perceptions are similar to those found in the study of eXtension reported here;

- understand further the use and acceptance of eXtension among professionals in other state Extension systems, particularly now that eXtension has developed a new membership model since the study reported here was conducted (Meisenbach, 2014); and

- examine further the applicability of the disruptive innovation theory in Cooperative Extension and higher education environments.

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