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The Effects of Outcome Expectations on Individual's Anxiety and Continued Usage of Mobile Devices: A Post-Adoption Study

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Abstract

Mobile devices support both work-related and non-work-related activities, thus allowing adopters to communicate with co-workers and family members, access and share information on the Internet, and manage business activities. The complexity of mobile applications can impact the degree to which users like or dislike their mobile devices. This study examined how preconceptions of personal-related and business-related outcome expectations impact user anxiety and the continued usage of mobile devices. Data collected from 158 Illinois farmers who use mobile devices revealed that performance expected outcome helps reduce anxiety and both types of expected outcomes lead to continued usage. In the post-adoption era, one's ability to utilize mobile devices for personal and business related purposes will fuel continued usage of smart devices. Knowing that anxiety is detrimental to continued usage, designers of mobile applications should find ways to reduce anxiety by focusing on users' preconceptions of how the devices are to be used.

Keywords: anxiety, continued usage, information and communication technologies (ICTs), mobile device, mobile applications

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Introduction

In the recent past, there has been an explosion in the use of mobile devices and their applications by farmers in the United States. A 2011 study by *Successful Farming* magazine revealed that 94% of respondents had "a cell phone, BlackBerry, iPhone, or other device that is also a cell phone" (Walter). 70.2% of U.S. farmers used their smartphones to obtain agriculture related information and services and 60.2% had access to the Internet via their smartphones. Approximately one-third of respondents indicated that they used their smartphones to access the Internet on a daily basis. The relative newness of mobile computing in U.S agriculture was substantiated by Woodill and Udell (2012) who reported that most scholarly articles on the subject had been published in 2011 and 2012. Reasons for the rapid increase in usage of mobile devices include the introduction of tablet computers, the introduction of mobile information portals for agriculture by government agencies and private enterprise, and the introduction of applications (apps) that allow wireless monitoring and management of farms and farm workers. Woodill and Udell compiled a list of 60 apps, 33% of which were farm management apps, designed for agriculture in Canada and the U.S.

Of interest to practitioners is the continuing use of mobile device technology, or what is referred to in the literature as post-adoptive information technology (IT) usage (Ortiz de Guinea and Markus 2009), by farmers. The objective of this study was to analyze the relationships among outcome expectations, anxiety associated with the use of mobile devices, and continuing use of mobile devices by farmers in Northern Illinois.

Theoretical Foundation

Ortiz de Guinea and Markus (2009) reviewed the literature pertaining to continuing IT use, and they observed two premises. The first is that continuing IT use is a series of conscious decisions, or reasoned actions, that involve two key inputs: 1) perceptions of ease of use and usefulness, and expectations derived from experiences and beliefs, and 2) a set of emotional responses to the use of technology. The second premise is that much of the observed continuing IT use is habitual behavior.

Most agricultural land is currently owned by older producers, and according to the Farm LASTS project at the University of Vermont, 70 percent of all farmland will change hands in the next 20 years. As younger farmers become more and more involved in decision making, agribusinesses and agri-marketers will need to know how these younger decision-makers prefer to receive information. Their preferences will likely differ from previous generations (Smither and Covrig 2012). There are many studies regarding U.S. farmers' adoption of computers and the Internet, but studies of information and communication technology adoption and diffusion of that technology among U.S. farmers are scarce (Amponsah 1995; Batte, Jones, and Schnitkey 1990; Jarvis 1990).

Gloy and Akridge studied factors that influence adoption of personal computers (PC) and utilization of the Internet by a small segment of the nation's commercial farms (sales in excess of $100,000). They found a positive correlation between total farm sales and adoption of personal computers. While age and education were found to be important in explaining the probability of

PC adoption, the probability of Internet use declined with age whereas likelihood of computer adoption increased with higher levels of education (above high school). Farms with detailed management plans were much more likely to adopt the Internet; however, Internet adoption was not strongly related to profit and production per unit of input maximization goals.

Batte and Ernst (2007) investigated how willing farmers were to substitute online merchants or national farm input stores for local businesses. They concluded that farmers were willing to "purchase inputs from online or national stores outside their communities if compensated with lower prices or if the national store was able to provide other services (ready availability or delivery)" (p.92).

Mishra et al. (2009) identified factors associated with adoption of computers with Internet access among U.S. farm households using 2004 Agricultural Resource Management Survey (ARMS) data. They specifically examined the farm, operator, spouse, presence of children, regional, and household characteristics and their influence on Internet purchasing patterns including purchase of farm business inputs and household items. They found that older farmers were less likely to adopt computers with Internet access and that participation in government programs increased the probability of Internet adoption. They suggested that "farm households will consider using the Internet as a low-cost method for marketing their products to a much broader set of consumers" (p.255).

There are a few, relatively recent studies that focused on farmers and adoption of information technology in other countries (Katengeza 2011; Islam 2011; Mittal and Tripathi 2009). Katengeza assessed drivers of adoption of mobile phone technology for agricultural marketing by smallholder farmers in Malawi. Islam investigated factors that influenced adoption of mobile phone technology by farmers in Bangladesh. Mittal and Tripathi analyzed the use and impact of mobile phones and mobile-enabled services on Indian farmers' agricultural productivity. They attempted to answer the following questions:

- Are mobile phones in practice being used for agricultural purposes, and if so, how?
- Have mobile phones helped improve the agricultural productivity of farmers, and if so, how?
- Which types of agricultural information are of high value for farmers?
- What are the constraints to the potential use of mobile phones in improving agricultural productivity?

The authors reported that Indian farmers benefited from mobile phone enabled information services through improved agricultural productivity. Warren's study of British farmers found positive associations between increasing use of information communication technologies (ICTs) and 1) increasing farm size and 2) farmer education, and a negative association between increasing use of ICTs and farmer age (Warren 2004).

The 2013 USDA-NASS survey revealed that 70% percent of U.S. farms had access to a computer, 67% had Internet access and 40% were using computers for their farm business. Within the state of Illinois, 71% of farmers had access to computers, 70% had Internet access and 53% used computers for farm business. While 47% of Illinois farmers used the Internet to

conduct business on non-agricultural websites, a very small percentage of them used the Internet to conduct business with the USDA and other federal agencies (8% and 7% respectively). The primary methods of internet access were Wireless (31%) and DSL (26%), followed by Satellite (19%), Cable (17%), and Dialup (2%). The 2012 Agriculture Census revealed that older farm operators were less likely to report Internet access (55.7% of farmers 65 years and older vs. 77% of farmers less than 45 years old). Moss (2012) suggested that while a conventional audience (the older farmer) might prefer to receive information primarily in print and broadcast, a contemporary audience (the younger farmer) is very comfortable with digital media and wants to participate in a social media conversation.

Walter (2011) reported that farmers were quickly adopting smartphone technology, and he identified several work-related functions that those devices allowed farmers to complete: sending/receiving email; checking weather, news, and markets; accessing agriculture related information and services; and text messaging family and employees. Slightly more than half, 53.8 percent, of farmers' smartphones contained GPS/navigation (telematics) functions. Farmers can also use the Internet to search for input suppliers and to locate potential buyers for their products (Mishra et al. 2009). As Whitacre et. al. (2014) suggest, information technology use at the farm-level includes mapping site-specific soil properties, yield monitors, variable rate applications, automated guidance and a recent emphasis on big data. They also stated that telematics require internet access with high speed wireless broadband. Walter (2011) found that younger farmers were making greater use of smartphones. Moss and Steever (2012) reported that farmers were using mobile devices to access the Internet on a daily basis because mobile devices are seen as quick and current.

Figure 1 shows the external and internal factors impacting technology acceptance. Internal factors include demographics of the individual farmer and their farm operations, record keeping practices, and number of employees. Technology availability and quality are considered external factors. Given the internal and external factors, farmers will evaluate the usefulness and ease of use of new information and communication technology before adopting it.

While previous studies have focused on how farmers utilize the Internet, few empirical studies have investigated post-adoption of ICTs by U.S. farmers. The rampant use of smart devices and tablets can be a determining factor that helps agribusinesses (input and service providers) and agri-marketers design more effective communication programs for farmer clients who must make farm-related decisions on a daily basis. The objective of this study was to investigate how post-adoption of mobile devices shapes users' outcome expectations, anxiety and continued usage. In other words, the study examined how the *post-adoption* of mobile devices —*the stage in which mobile device usage has already brought forth user's perceived expected outcomes*— influences anxiety and continued usage once users have adopted the technology.

Expectation outcomes were separated into two categories, personal and performance, as per Compeau et al. (1999). In our context, performance outcome expectation is defined as the perceived improvements in job effectiveness and efficiency when using mobile devices. Personal outcome expectation is "related to expectations of change in image or status or to expectations of rewards" (Compeau et al. 1999, 148). Anxiety is the negative feeling that one has when using a mobile device. Therefore, the research was designed to answer the following questions:

(1) Do users' personal and performance outcome expectations affect anxiety or continued usage? And; (2) Does a users' anxiety affect continued usage?

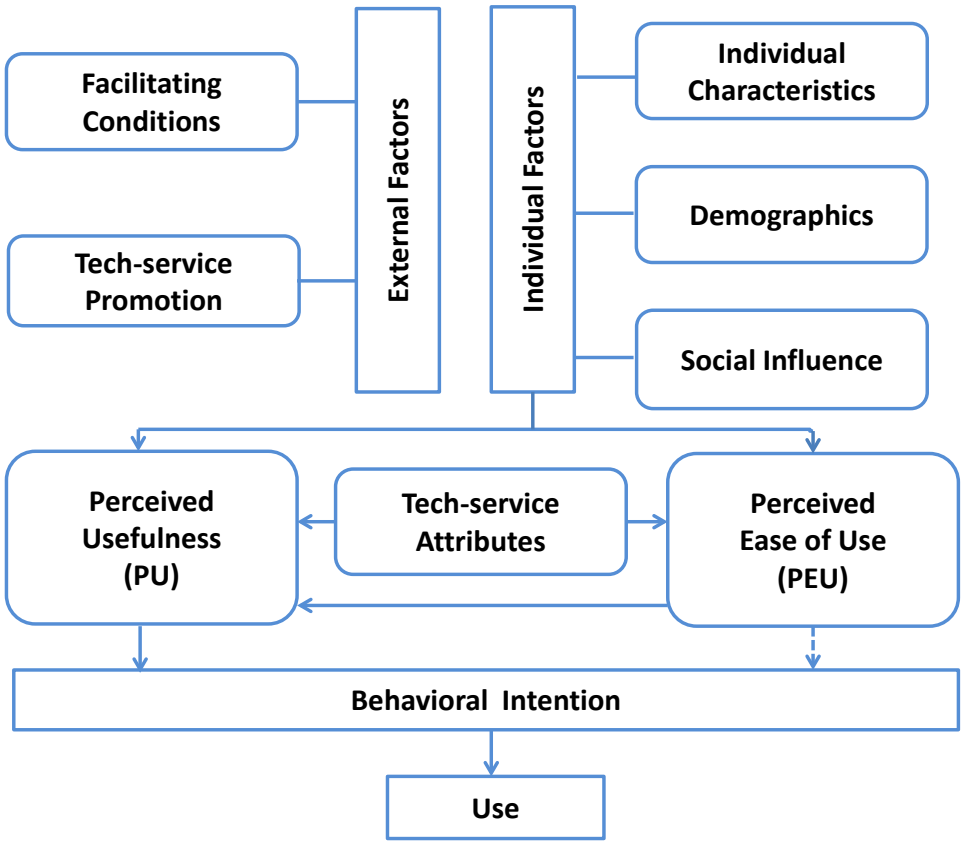

Figure 1. The Rural Technology Acceptance Model (RuTAM)
Source. Islam 2011

Research Model

Islam (2011) applied Davis' (1989) Technology Acceptance Model (TAM) in rural settings (RuTAM) in Bangladesh, and found that both external and internal factors contributed to the usage of a specific information technology. To date, a considerable number of empirical studies have attempted to extend the framework by adding relevant, exogenous constructs to the model. However, TAM does not predict the consequences after initial adoption.

The Information Systems (IS) Success Model, proposed by DeLone and McLean (l992), suggests a comprehensive view of information technology usage from initial adoption to post adoption—the stage in which the technology has been accepted by the majority. In this context, information technology use and user satisfaction are mediating factors that lead to individual impact and later organizational impact (DeLone and McLean 1992). Furthermore, our proposed research model takes on a similar theme as suggested by de Guinea and Markus (2009), revealing that post-adoption of information technology involves users' rational decision making; emotion and habitual, which is influenced by "environment cues" and "conscious intention".

A post-adoption behavior of the user of ICTs can be determined by accessibility of ICT that allows users to compare their expected outcomes to the actual outcomes (Bhattacherjee 2001). In the post-adoption scenarios, the reduced gap between prior and post outcome expectations motivates continuous usage, unless habitual usage overrides rational thinking or emotional responses (de Guinea and Markus 2009).

When individuals utilize mobile devices on a daily basis, usage activities can become a habitual routine. However, when post-adoption usage behaviors are not habit-forming, the ubiquitous nature of smart phones and devices is the interplay between rational decisions and emotional reactions. Wakefield and Whitten (2006) reported that the combined aspects of work-related and non-work-related behaviors motivate mobile usage. Bruner and Kumar (2005) found that work-related and non-work-related activities are the necessary ingredients for the adoption of consumer-based Internet handheld devices. This understanding, therefore, put our study in the context of rational decision making and emotional response of ICT usage: On one hand, U.S. farmers seek to increase their business-related activities through the use of their smart devices, while on other hand, they also utilize the devices for personal (non-work-related) activities. Both personal and business-related activities conjure up two dominant emotional responses (i.e., anxiety and continued usage) as consequences of post-adoption expectations. Figure 2 shows the proposed research model.

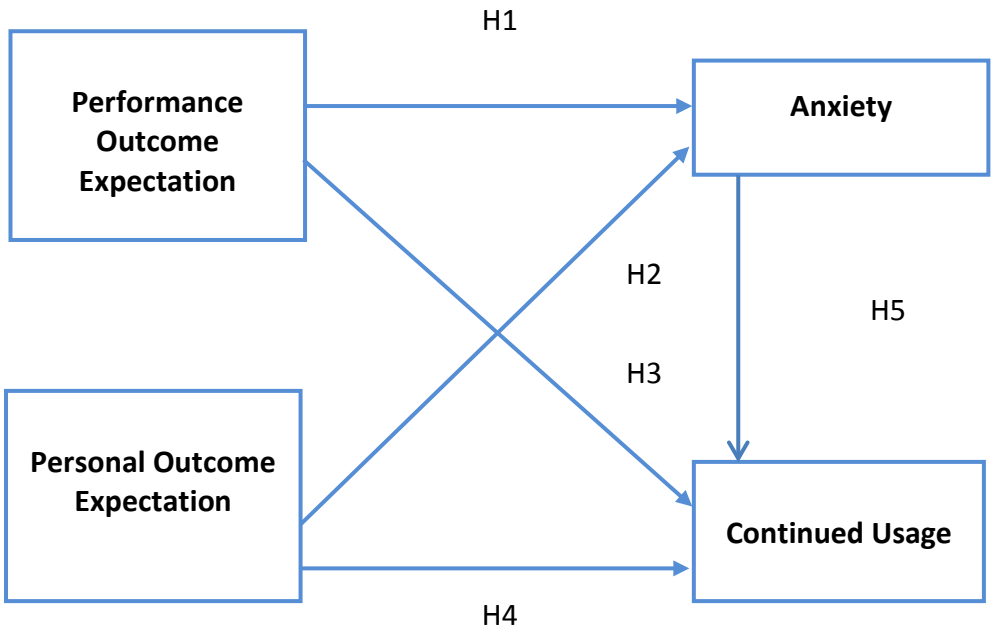

Figure 2. Proposed Research Model

Hypotheses

Researchers have found that anxiety and performance are negatively correlated. In the area of information technology education, the experience from using e-mail and the Internet has a negative relationship with anxiety (Fuller, Vician and Brown 2006). Because ICTs facilitate

written and voice communication, Vician and Davis (2003)—in their study related to computer-based learning—discovered that higher levels of computer anxiety combined with voice communication led to decreased performance. Desai (2001) generalized from existing literature that "a negative relationship exists between computer anxiety and performance" (p. 141) and questioned whether, based on the exploratory findings, the relationship between the level of computer anxiety and performance can be lessened by task familarity. In the context of post-adoption behavior, users are quite familiar with various tasks on their smart devices. It is possible, therefore, that performance and personal outcome expectations will have an effect on anxiety. Therefore, we propose the following hypotheses:

H1: Performance outcome expectation will have a negative influence on anxiety.
H2: Personal outcome expectation will have a negative influence on anxiety.

Research suggests that user's perception of technology—combined aspects of intrinsic and extrinsic motivation (i.e., enjoyment, usefulness, playfulness and ease of use)—foster continued micro-blogging activities (like Twitter) (Agrifoglio et al. 2012). A qualitative examination leads to the conclusion that external factors (i.e., technological, organizational and environmental) along with self-efficacy and expectations lead to continued technology usage (Hossain and Quaddus 2011). Hsu et al. (2004) validated that user's "prior perceived confirmation," prior satisfaction, and self-efficacy lead to continued usage of the Internet. Specifically, their results indicated that outcome expectation provides the strongest support for continued usage (Hsu et al. 2004). Performance expectancy, social influence (personal expectancy) and user satisfaction enhance the utilization of information technology (Kim et al. 2007). Generally, users anticipate positive consequences as a result of technological usage. Any positive consequences will reinforce continued usage; negative or unanticipated consequences will lead to anxiety and discontinued usage. Compeau et al. (1999) revealed that anxiety reduces information technology usage. Based on these empirical findings, we propose three additional hypotheses:

H3: Performance outcome expectation will have a positive influence on continued usage.
H4: Personal outcome expectation will have a positive influence on continued usage.
H5: Anxiety will have a negative influence on continued usage.

Data Collection

A questionnaire was mailed to 1,000 farmers who were randomly selected from a list maintained by 1st Farm Credit Services of Illinois. The main decision maker was asked to complete the questionnaire, which included questions about farm and farmer demographics (age, education, gross farm income, number of employees, and acres farmed); current ICT use (type of cellular phone, computer, tablet); preferred sources of information for farm related decisions (in print vs. electronically/digital, social media use, text messages, farm related websites, etc.); types of work-related activities farmers do or would like to accomplish via ICTs; and challenges faced when adopting ICTs. A $1,000 donation to St. Jude Children's Research Hospital on behalf of the respondents was offered as an incentive to participate. Respondents were also offered a copy of the study results. The original mailing occurred in mid-April 2012, and a second mailing occurred in June 2012.

Of 360 respondents, the study used information provided by 158 individuals who had at least one mobile device (i.e., smart phone or tablet) in their possession, and who responded to all questions related to continued usage, anxiety, and outcomes expectations. We analyzed non-response bias by comparing the average age, average acres farmed, and four other research variables by those who returned the first mailing of the questionnaire to those who returned the second mailing. Such a comparison has been proposed by Lindner, Murphy, and Briers (2001), who cited extrapolation methods based upon the notion that late respondents are similar to non-respondents. Lindner, Murphy and Briers suggested that the group of late respondents contain a minimum of 30 individuals. There was two years of age and 28 acres difference between the first and second mailing respondents, which were statistically insignificant. There were no statistically significant differences in performance outcome expectation, personal outcome expectation, anxiety, and continued usage scores either. Based on Table 1, we concluded that there was no non-response bias which means that non responses did not impair the representativeness of the current sample.

Table 1. Test for Non-response Bias

	1st Mailing (n=112)		2nd Mailing (n=46)		
Variables	**Mean**	**St. Dev.**	**Mean**	**St. Dev.**	**t-test**
Age	48.4	13.3	46.3	14.2	.867, p=.387
Size of farm	1,539.0	1,680.3	1,511.0	1,846.3	.088, p=.088
Performance Outcome Expectation	3.51	.87	3.48	.90	.249, p=.804
Personal Outcome Expectation	2.91	.78	2.75	.76	1.178, p=.242
Anxiety	2.32	.89	2.25	.93	.463, p=.644
Continued Usage	3.21	.85	3.24	.94	-.181, p=.857

The average age of the respondents was 48 years, who have been farming for almost 24 years (Table 2). On average, they farmed 1,512 acres of which 964 acres were corn, 413 acres were soybeans, 15 acres were wheat, and 119 acres were marked for other. The majorityof the respondents consisted of males (93%). Almost 47% of the respondents obtained a baccalaureate or higher degree (46.8%), while 36.1% had some college or had completed a 2-year degree; 15.2% had completed high school, and a small number had not finished high school (1.3%). Half of the respondents considered themselves as first or one of the first to adopt a new technology (50.7%) while 3.8% said they are the last person to adopt a new technology. When asked to assess their general attitudes toward risk, which was undefined in the questionnaire, 9.5% of respondents identified themselves as risk averse. Alternatively, risk neutral was selected by 53.2% of respondents, and 35.4% of respondents identified themselves as risk takers. Almost 80% of the respondents use desktop computer to access internet, while 74.8% use laptop computer, 74% use a cell phone, and 56% use a tablet for internet access. Wireless and DSL were the top two connection options used to access internet, however, information on the speed of connection was not asked. Respondents used internet to check markets (97%) and weather (97%), lookup balances (88%), use marketing advisory services (73%), transfer money (67%), purchase inputs (51%) and manage on-farm systems such as GPS (39%). It is important to note that while 64% of the respondents had no livestock, 23% raised livestock, 5% raised hogs, and 4% raised dairy cattle.

Table 2. Demographics

Average age	48 years	Gender	93% Male 7% Female
Number of years farming	24 years	New Technology adoption	7% First person to adopt 43.7% One of the first people to adopt 44.3% One of the majority to adopt 3.8% Last person to adopt
Acres farmed Corn Soybean Wheat Other	1,512 acres 964 acres 413 acres 15 acres 119 acres	Attitude towards risk	9.5% Risk averse 53.2% Risk neutral 35.4% Risk taker
Livestock	64% None 5% Hogs 4% Dairy cattle	Devices used to access Internet	80% Desktop computer 74.8% Laptop 74% Cell phone 56% Tablet
Activities using Internet	97% Check markets 97% Check weather 88% Lookup balances	73% Use marketing advisory services 67% Transfer money	51% Purchase inputs 39% Manage on-farm systems

Measures

The study adopted methods used by Compeau and Higgins (1995), who derived their items from various psychological measures using a five-point scale (Table 3). To capture *continued usage*, the study applied the measurement of affect—"likability" (Compeau and Higgins, 1995). The respondents were asked the extent to which they agreed or disagreed with "I like working with mobile devices," "Once I start working on the mobile device, I find it hard to stop," and "I look forward to those aspects of my job that require me to use a mobile device." *Anxiety* was captured with items such as "Using a mobile device is frustrating to me," "I hesitate to use a mobile device for fear of making mistakes I cannot correct." *Personal outcome expectations* captured intrinsic motivational outcomes, as reflected by competence, status, and accomplishment. Respondents were asked "My coworkers will perceive me as competent if I use a mobile device," "I will be seen as higher in status by my peers if I use a mobile device," "I can increase my sense of accomplishment by using a mobile device." *Performance outcome expectations* were derived from job-related dimensions such as "Mobile device can make me better organized," "Mobile device can increase my effectiveness on the job."

Table 3. List of Measurement Items Used in the Study

Performance Outcome Expectations	**Anxiety**
Mobile device can make me better organized [PERFE1]	Using a mobile device is frustrating to me [ANX1]
Mobile device can increase my effectiveness on the job [PERFE2]	I feel apprehensive about using mobile devices [ANX2]
I could spend less time on routine job tasks by using mobile devices [PERFE3]	It scares me to think that I could cause the mobile device to destroy a large amount of information by hitting the wrong key [ANX3]
Quality of output of my job can increase with mobile devices [PERFE4]	I hesitate to use a mobile device for fear of making mistakes I cannot correct [ANX4]
I can increase the quality of output for the same amount of effort with mobile devices [PERFE5]	Mobile devices are somewhat intimidating to me [ANX5]
Personal Outcome Expectations	**Continued Usage**
My coworkers will perceive me as competent if I use a mobile device [PERSE1]	I like working with mobile devices [CUSE1]
I can increase my sense of accomplishment by using a mobile device [PERSE2]	I look forward to those aspects of my job that requires me to use a mobile device [CUSE2]
I will be seen as higher in status by my peers if I use a mobile device [PERSE3]	Once I start working on the mobile device, I find it hard to stop [CUSE3]

Data Analysis

Linear regression analyses were conducted following guidelines recommended by Gefen et al. (2000); therefore data analyses involved two steps. First, each research variable was tested to ensure construct validity and reliability using principle components analysis (PCA) (Smith, 2002) and Cronbach's alpha, respectively. PCA helped assure that each variable was distinct, thus reducing the possibility of multicollinearity; while Cronbach's alpha established the reliability of our research constructs. Second, two regression analyses were performed wherein anxiety and continued usage were regressed on performance expectations and personal outcome expectations. Items with the highest loading were used to represent the variables in the regression analyses. Hypotheses were tested at a 0.05 significance level using F- and t- tests.

Results

Table 4 shows the construct validity based on PCA and composite reliability values for each variable. Construct validity is realized after each item is significantly 'loaded' onto its designated variable. Composite reliability values were higher than 0.7, supporting the internal consistency among measurement items within each construct.

Our first regression—where anxiety was regressed on performance and personal outcome expectations—revealed a significant F-statistic of 11.58 ($p<.001$) with a coefficient of determination of .13. Our results showed that performance outcome expectation negatively influenced users' anxiety while personal outcome expectation had a non-significant impact on users' anxiety. In addition, by regressing continued usage onto anxiety, performance outcome

and personal outcome expectations, the result of our second regression showed a significant F-statistic of 48.63 (p<.001) with a coefficient of determination of 0.486, supporting Hypotheses 3 through 5. With the exception of Hypothesis 2, each regression path also had significant t-values, which supported our proposed hypotheses, revealing that both performance and personal outcome expectations fueled continued mobile device activities.

Table 4. Construct Validity and Composite Reliability

		Latent Construct Loading				
Research Variable	**Surveyed Items**	**Performance Outcome**	**Personal Outcome**	**Anxiety**	**Continued Usage**	**Reliability Coefficient**
Performance Outcome Expectations	PERFE1	.705	-.028	-.204	.307	.904
	PERFE 2	.796	.112	-.245	.258	
	PERFE 3	.832	.232	-.093	.063	
	PERFE 4	.823	.284	-.098	.179	
	PERFE 5	.796	.216	-.156	.152	
Personal Outcome Expectations	PERSE1	.090	.656	-.124	.307	.718
	PERSE2	.384	.711	-.002	.208	
	PERSE3	.169	.857	.115	-.043	
Anxiety	ANX1	-.097	.010	.655	-.365	.880
	ANX2	-.057	.059	.806	-.313	
	ANX3	-.162	-.128	.860	.235	
	ANX4	-.237	-.102	.865	.110	
	ANX5	-.155	.138	.818	-.219	
Continued Usage	CUSE1	.478	.085	-.323	.617	.764
	CUSE2	.341	.291	-.210	.765	
	CUSE3	.373	.272	.090	.550	

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Our results were based on the hypothesized research model, focusing on empirical evidence among the four research variables, i.e., personal outcome, performance outcome, anxiety and continued usage. Age, size of farm, and education were not a part of the hypothesized research model. However, to rule out of the effects of these demographic characteristics, each of the four research variable were regressed onto age, size of farm, and education. These additional regression analyses revealed that only age had a significant effect on continued usage (F-statistic = 3.07, p =.03) with unstandardized coefficients of -.013 (t=-2.581, p = 0.11), and it accounted for six percent of the variance explained in continued usage when only demographic characteristics were used as the predictors to continued usage. Age accounted for only 1.6 percent of the variance explained in continued usage when added to the research model. None of the other research variables, however, were influenced by demographics.

In sum, multiple linear regression analyses were conducted to evaluate the prediction of anxiety and continued usage from the performance and personal outcome expectations. As hypothesized, users' anxiety is negatively influenced only by performance outcome expectations (β=-.41, t = -4.78, p < .001); supporting Hypothesis 1 (Table 5). However, Hypothesis 2 was rejected due to an insignificant result (β=.15, t=1.76, p=.081), suggesting that personal outcome expectation did not create users' anxiety. Both the performance outcome expectation (β=.49, t=6.95, p < .001)

and personal outcome expectation (β=.24, t=3.55, p = .001) influence also continued usage. Anxiety had an inverse relationship with continued usage (β=-.16, t=-2.61, p = .01), demonstrating that performance outcome expectation can indirectly hinder the continued usage of mobile devices. The overall fit of the regressions, determined by R2, showed that our proposed model accounted for 13 percent of the variance explained in anxiety and 49 percent of the variance explained in continued usage.

Table 5. Hypothesis Testing through Multiple Regression

Hypothesis	Beta	t-value	Sig.	Result
H1: Performance Outcome Expectations → Anxiety	-.407	-4.776	.000	Supported
H2: Personal Outcome Expectations → Anxiety	.150	1.756	.081	Not Supported
H3: Performance Outcome Expectations → Continued Usage	.489	6.951	.000	Supported
H4: Personal Outcome Expectations → Continued Usage	.236	3.552	.001	Supported
H5: Anxiety → Continued Usage	-.161	-2.607	.010	Supported

Discussion and Conclusions

Results showed that performance outcome expectations of users negatively influence the anxiety, which negatively influences continued usage of information communication technology by the farmers. In other words, if the farmer believes a mobile device can increase his/her effectiveness on the job, he/she would feel less anxious about the device and therefore more likely to continue to use the mobile device. Personal outcome expectation has a direct influence on continued usage. The farmer is more likely to have a continuous usage of a mobile device if the farmer believes that using mobile device makes him/her seen as competent by his/her coworkers/peers. However, the motivation for Illinois farmers to continuously utilize mobile devices and ICTs in their agribusinesses may involve other factors beyond the scope of this current study, given that our research model captures only about half of the variance explained in continued usage.

For instance, ICTs allow farmers find answers for many questions on subjects like farming practices, input and commodity prices, weather conditions, or industry trends faster and instantaneously with greater ease and increased accuracy. Knowing what channels of information and knowledge for products and services customers value and use the most would be beneficial to any business. According to Ernst and Young Report (2009), this type of information would enable businesses to administer cost saving initiatives without adversely impacting the channels or elements of the products and services that core customers value. ICTs have the potential to build higher levels of customer engagement and loyalty, if the agribusinesses successfully communicate the benefits of ICT adoption to the customers in the form of increased productivity and agricultural output.

The results could be useful for agribusinesses and agri-marketers who are interested in knowing more about their changing customer base as younger generation of farmers are taking over more responsibilities at the farm and are getting involved in the business decision making process. Knowing the farmers' preferences towards in print vs. electronic/digital delivery could help companies customize their information delivery method based on their customers' demographics. This type of customization could allow firms to "go green" without aggravating some of their customers.

While agribusinesses need to maintain a balanced media plan by incorporating smartphone marketing techniques into their media plan, they could also plan, design, and improve their correspondence with customers, especially with those who have challenges with connecting to the Internet via computers and cell phones (high speed broadband connection, cell phone service availability, etc.) (Moss and Steever 2012).

Moreover, very high level of technical competence is a sought after characteristic the farmers look for in a salesperson. Farmers also want their salesperson to provide them relevant and timely information (Downey, 2013). It could be the salesperson's role to introduce ICT offerings to the farmers which could help them provide the information and knowledge the farmer needs and is looking for in a timely manner. Farmers place high importance to field days and dealer/retailer meetings as sources of information (Akridge, 2013). Agribusinesses could take advantage of these points of contact with the farmers and show farmer customers how they can use the ICTs such as apps, social media website, and text alerts while reducing anxiety of use and highlighting the potential positive performance and personal outcomes which would then lead to continued usage of ICTs offered by the agribusinesses. Future research can investigate these potential factors to motivate continuous ICT usages among farming communities, while addressing impact of high speed wireless broadband on adoption of ICTs including telematics.

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References

2012 Agriculture Census. Selected Farm Characteristics by Race of Principal Operator: 2012 and 2007.http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_1_US/st99_1_060_060.pdf [accessed June 9, 2014].

Akridge, J. 2013. Communicating benefits to decision makers: Growth and technology. Presentation at the National Agribusiness Conference. November 2013. https://www. agecon. purdue.edu/cab/programs/nca/national_conference_2013.zip [accessed December 14, 2014].

Agrifoglio, R., S. Black, C. Metallo and M. Ferrara. 2012. Extrinsic versus intrinsic motivation in continued twitter usage. *Journal of Computer Information Systems*53(1): 33-41.

Amponsah, W. A. 1995. Computer adoption and use of information services by North Carolina commercial farmers. *Journal of Agricultural and Applied Economics* 27(2): 565–576.

Batte, M.T., and S. Ernst. 2007. Net gains from net purchases? Farmers' preferences for online and local input purchases. *Agricultural and Resource Economics Review* 36(1): 84–94. http://ageconsearch.umn.edu/bitstream/10154/1/36010084.pdf. [accessed February 2, 2012].

Batte, M. T., E. Jones, & G.D. Schnitkey. 1990. Computer use by Ohio commercial farmers. *American Journal of Agricultural Economics* 72(4): 935–945.

Bhattacherjee, A. 2001. Understanding information systems continuance: An expectation-disconfirmation model. *MIS Quarterly* 25(2): 229-254.

Bruner, G. C. and A. Kumar . 2005. Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research* 58(5): 553-558.

Compeau, D. R., C. A. Higgins and S. Huff. 1999. Social cognitive theory and individual reactions to computer technology: a longitudinal study. *MIS Quarterly* 23(2): 145-158.

Compeau, D. R. and C. A. Higgins. 1995. Computer self-efficacy: development of a measure and initial test. *MIS Quarterly* 19(2): 189-211.

Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13(3): 319-339.

deGuinea, A. O. and M. L.Markus. 2009. Why break the habit of a lifetime? Rethinking the roles of intention, habit, and emotion in continuing information technology use. *MIS Quarterly* 33(3): 433-444.

Delone, W. and E. McLean. 1992. Information systems success: the quest for the dependent variable. Information Systems Research 3(1): 60-95.

Desai, M. S. 2001. Computer anxiety and performance: an application of a change model in a pedagogical setting. *Journal of Instructional Psychology* 28(3): 141-149.

Downey, Scott. 2013. Creating and Communicating Value to Commercial Producers. Presentation at the National Agribusiness Conference. November 2013.https://www.Age con.purdue.edu /cab/ programs/nca/national_conference_2013.zip. [accessed December 14, 2013].

Ernst and Young. 2009. Cutting costs not customers: Maintaining customer loyalty in a challenging market. http://www.ey.com/Publication/vwLUAssets/Cutting_costs_not _customers__ Maintaining_customer_loyalty_in_a_challenging_market/$FILE/Cutting_costs_not_cust omers.pdf. [accessed December 17, 2013].

Fuller, R.M., C. Vician and S. A. Brown, 2006. E-learning and individual charactersitics: the role of computer anxiety and communication apprehension. *Journal of Computer Information Systems Education* Summer 46(4):103-115.

Gefen, D., D. W. Straub and M. Boudreau. 2000. Structural equation modeling and regression: guidelines for research practice. *Communications of the Association for Information Systems*, 4 (Article 7). http://cits.tamiu.edu/kock/NedWebArticles/Gefenetal2000.pdf [accessed November 5, 2004].

Gloy, B. A. and J. T. Akridge. 2000. Computer and internet adoption on large U.S. farms. *International Food and Agribusiness Management Review* 3(3): 323–338.

Hossain, M. A. and M. Quaddus. 2011. The adoption and continued usage intention of RFID: an integrated framework. *Information Technology & People* 24(3): 236-256.

Hsu, M. H., C. M. Chiu and T. L. Ju. 2004. Determinants of continued use of WWW: an integration of two theoretical model. *Industrial Management & Data Systems* 104(9): 766-775.

Islam, M. Sirajul. 2011. Adoption of mobile phones among the farmers: A case study from rural Bangladesh. MSc Thesis in Informatics. Örebro University, Swedish Business School. oru.diva-portal.org/smash/get/diva2:440085/FULLTEXT01. [accessed February 1, 2012].

Jarvis, A. M. 1990. Computer adoption decisions–implications for research and extension: the case of Texas rice producers. *American Journal of Agricultural Economics*. 72(5): 1388–1394.

Katengeza, S. P., J. J. Okello, and N. Jambo. 2011. Use of mobile phone technology in agricultural marketing: The case of smallholder farmers in Malawi. *International Journal of ICT Research and Development in Africa* 2(2): 14-25. July-December 2011.

Kim, C., J. Jahng and J. Lee. 2007. An empirical investigation into the utilization-based information technology success model: integrating task-performance and social influence perspective. *Journal of Information Technology* 22(2): 153-160.

Lindner, James R., T. H. Murphy, and G. E. Briers. 2001. Handling nonresponse in social science research. *Journal of Agricultural Education* 42(4): 43-53.

Mishra, A. K., R. P. Williams, and J. D. Detre. 2009. Internet access and internet purchasing patterns of farm households. *Agricultural and Resource Economics Review*. 38(2): 240–257.

Moss, Kristi. The New Ag Media Model: Conventional + Contemporary Strategies. http://agribranding.s3.amazonaws.com/The+New+Ag+Media+Model.pdf [accessed January 5, 2012].

Moss, K. and S. Steever. Adoption of Communication Tools in Agriculture. http://agribranding.s3.amazonaws.com/Adoption+of+Communication+Tools+in+Agriculture.pdf. [accessed January 5, 2012].

Mittal, S. and G. Tripathi. 2009. Role of Mobile Phone Technology in Improving Small Farm Productivity. *Agricultural Economics Research Review*. 22: 451-459.

Ortiz de Guinea, A. O. and M. L. Markus. 2009. Why break the habit of a lifetime? Rethinking the roles of intention, habit, and emotion in continuing information technology use. *MIS Quarterly* 33(3): 433-444.

Smith, Lindsay I. 2002. A tutorial on Principal Components Analysis. www.cs.otago.ac.nz/ cosc453/student_tutorials/principal_components.pdf. [accessed June 11, 2015]

Smither, Mark and Heather Covrig. How Multi-Generational Farming Operations Make Major Purchase Decisions. http://agribranding.s3.amazonaws.com/How+Multi-Generational+Farming+Operations+Make+Major+Purchase+Decisions.pdf. [accessed January 2, 2012].

The Farm LASTS Project. Online Manual. http://www.uvm.edu/farmlasts/?Page=about.html. [accessed January 2, 2012].

USDA-NASS. 2013. Farm computer usage and ownership. August 2013. http://usda01.library. cornell.edu /usda/current/FarmComp/FarmComp-08-20-2013.pdf [accessed December 1, 2013].

Vician, C.and L. R. Davis. 2003. Investigating computer anxiety and communication apprehension as performance antecedents in a computer-intensive learning environment. *Journal of Computer Information Systems* 43(2): 51-57.

Wakefield, R. L. and D. Whitten. 2006. Mobile computing: a user study on hedonic/utilitarian mobile device usage. *European Journal of Information Systems* 15(3): 292-300.

Walter, John. Smartphones a Big Trend. http://www.agriculture.com/farm-management/ technology/cell-phone-and-smart-phones/smartphones-a-big-trend_325-ar20351. [accessed January 2, 2012].

Warren, Martyn. 2004. Farmers online: drivers and impediments in adoption of Internet in UK agricultural businesses. *Journal of Small Business and Enterprise Development.* 11(3): 371-381. http://www.emeraldinsight.com/journals.htm?articleid=873794&show. [accessed February 1, 2012].

Whitacre, B. E., B. M. Tyler, and T.W.Griffin. 2014. How connected are our farms? *Choices Magazine*. 3rd Quarter. 29(3): 1-9.

