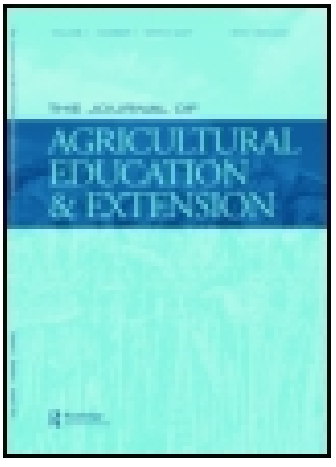

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Exploring the Use of Information Communication Technologies by Selected Caribbean Extension Officers

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Exploring the Use of Information Communication Technologies by Selected Caribbean Extension Officers

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ABSTRACT Purpose: *The purpose of this study was to describe selected Caribbean extension officers' technology preferences and examine factors that may affect their technology preferences.*
Design/methodology/approach*: The sample consisted of extension officers (N = 119) participating in professional development training sessions in Grenada, Belize and Saint Lucia. A 29-item instrument with a four-point scale was used to gather data on technology preferences. Descriptive and inferential statistics were used to analyse the data.*
Findings*: Extension officers used Information Communication Technologies (ICTs) for personal benefits and increased professional productivity but then would use traditional interaction methods with farmers. Education levels of extension officers played a part in technology acceptance; higher levels of education earned led to an increase in technology use.*
Practical Implications: *An increase in awareness is important for the further adoption of ICTs for extension purposes. Organisations in both the public and private sector must work to increase knowledge of ICTs for the benefit of stakeholders. The use of ICTs can increase productivity for extensions officers and expand educational opportunities for learners.*
Originality/value: *The use of information communication technologies (ICTs) by extension to disseminate educational materials around the world is widespread. While ICTs exist, extension officers' level of acceptance in using technology for their core job functions may prohibit the dissemination of ICTs to farmers. Increasing awareness and use of ICTs can lead to more productive relationships between extension officers and agricultural stakeholders.*

KEY WORDS: Extension officers, Information and communication technologies, Technology preferences, Technology acceptance model, Caribbean, Professional development

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Introduction

Extension services within the Caribbean region are typically charged with improving the livelihoods of farmers and increasing overall food security (Moberg 2005). However, government-led extension is challenged by a lack of resources, especially human resources. It is common for one officer to serve an area with 600 farmers (W. Ganpat, personal communication, 8 March 2014). The traditional model of extension delivery has been based upon the method of individual contact, but the lack of human resources means farmers often go long periods without seeing their officers which compromises the quality and effectiveness of services (Sealy 2003). Alternative group contact methods have been tried, but have not presented an ideal solution for increasing the frequency of contact between officers and farmers. A better solution is needed; the adoption of information and communication technologies as an educational tool by extension officers may be that solution.

Information and communication technologies (ICTs) are electronic tools for storing, processing, and disseminating extension information and communication (Balaji, Meera, and Dixit 2007). The new century has given rise to the use of information technologies among extension and agricultural stakeholders to convey information, knowledge, and innovations to agricultural populations (Raj 2012). The advantages of using information technologies in developing countries are trade, knowledge exchange, tourism, and foreign investment (Hoekman, Maskus, and Saggi 2005). However, a lack of information technological resources inhibits extension officers' capacity to pursue the latest knowledge and share the information with farmers (Bruening et al. 2002).

Robinson (2008) suggested ICTs can disseminate learning opportunities more equitably and broadly to target audiences, which are key factors for improving communication between extension officers and farmers in the Caribbean. In order to increase access to information and facilitate agricultural processes, agricultural stakeholders need to enhance the role of ICTs in extension services (Masiello-Rome et al. 2008). ICTs can be used to enhance farmers' agricultural development and their standard of living (Achugbue and Anie 2011), which are outcomes consistent with the goals of Caribbean extension services.

The potential value of ICT usage in extension remains unrealised; unfavourable attitudes and a lack of competency are documented issues. Mwansa (2004) found the primary reason extension officers did not use ICTs for teaching and transferring information to farmers was based on extension officers' attitudes toward the technology. Formalised training for extension personnel, delivered by governmental agencies, institutions, and NGOs, is needed to develop competency using ICTs to disseminate information to farmers (Ovwigho et al. 2009). ICT training programmes for extension officers should include training experiences with the latest information technologies available (Aboh 2008).

The ICT Development Index is a statistical tool designed to measure the relative application and use of ICTs on a comparative global scale (International Telecommunications Union 2009). The ICT Development Index for the Caribbean region falls below the expected level of ICT use even though the region is among the top 50% of countries with ICT access and infrastructure. Further, the region lags behind in the adoption of agricultural ICTs (International Telecommunications Union 2009). Extension services are uniquely positioned to lead efforts designed to increase knowledge within developing

countries, and therefore should be prepared to integrate instructional technology into programming. Ganpat and De Freitas (2010) recommended a situational analysis on the use of ICTs in Caribbean agricultural extension. This study begins to address that recommendation by exploring the technology use and preferences of Caribbean extension officers.

Theoretical Framework

This study was framed by the theory of reasoned action (Fishbein and Ajzen 1975) and bound by Davis' (1989) Technology Acceptance Model (TAM). The theory of reasoned action postulates an individual's behavioural intention is determined by his or her beliefs and subjective norms towards the behaviour. Beliefs are the fundamental influence on an individual's attitude toward a behaviour. Norms influence an individual's aspirations for performing the behaviour (Fishbein and Ajzen 1975). The three conditions that affect the association between behaviour and intentions are: (a) the intention is within an individual's locus of control, (b) the constancy of intentions between time of assessment and performance of behaviour, and (c) the extent of intention and the behavioural condition equal their levels of agreement (Fishbein and Ajzen 1975). Behavioural intentions affect attitudes and subjective norms. Ajzen (1985) indicated perceived control is a cause of behavioural intentions.

Davis (1989) developed the TAM based on Fishbein and Ajzen's (1975) Theory of Reasoned Action. The TAM (see Figure 1) states that perceived ease of use and perceived usefulness determines an adult's intent to use a technological system (Davis 1989). The TAM is the leading technique to describe and predict adult technology usage (Chuttur 2009).

Two important components of the TAM are perceived usefulness and perceived ease of use. Perceived usefulness relates to an individual's belief that a particular technology system will increase his or her job performance (Davis 1989). Perceived ease of use is how a person thinks about the amount of effort required to use a particular technology system (Davis 1989). These two constructs help determine an individual's intent to use technology.

The TAM is an influential model for explaining the intention to use technology (Schepers and Wetzels 2007). An understanding of this model is important for those studying the acceptance of technology (Chuttur 2009). Bagozzi (2007) noted one of the strengths of the TAM is its perceived usefulness and perceived ease of use to

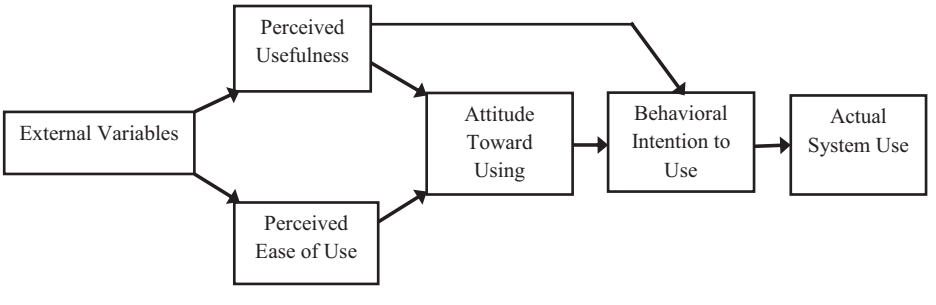

Figure 1. Technology acceptance model.

determine technology usage intentions. The use of the TAM can also lead to interventions to encourage technology acceptance (Venkatesh and Bala 2008). This model can be used to evaluate intentions in regards to educational technology (Wu, Hiltz, and Beiber 2010). The technology preferences of extension clientele in New Zealand (Massey et al. 2004) and extension clientele in the United States of America (Howell and Habron 2004) have been evaluated with the TAM. This study utilised the TAM to examine extension officers' technology use and preferences.

International agricultural and extension education researchers (Phelan and Mulhall 2007) have examined the use of instructional technology in informal and formal learning environments. Ganpat and De Freitas (2010) discussed the ICT status of most Caribbean countries. They noted that in Grenada and St. Lucia, the competition between two major ICT support firms meant that access to both service and hardware was becoming affordable and ICTs were increasingly being accessed by rural people to include farmers. In addition, in Grenada a modern communication unit was established in the Agriculture Ministry with advanced equipment to improve technology information dissemination to farmers. Staffing levels and training were also being improved. In St Lucia, an upgrading of the Information Centre was being done and a higher level of interactivity was being built into the Ministry's website to answer farmers' queries in a much more timely manner, disseminate information, and do some level of training. In Belize, while the government extension had limited access and used the technology minimally, the NGOs and other rural-based non-government organisations used ICTs to communicate with small farmers. Moreover, in the rural areas these resources were sometimes shared with government extension staff.

Purpose and Objectives

This study was a part of larger study designed to assess the professional development needs of selected Caribbean extension officers. More specifically this study sought to:

(1) Describe selected Caribbean extension officers' technology use and preferences; and
(2) Determine if differences existed in selected Caribbean extension officers' technology preferences according to personal characteristics.

Methodology

This study used an ex post facto design to study the variables of interest. The population consisted of a convenience sample of extension officers (N = 119) participating in professional development workshops in three countries in the Caribbean region; Grenada, St. Lucia and Belize. These countries were purposively selected because the level of ICT infrastructure that existed was sufficient to support the use of ICTs by extension to improve the lives of rural people.

The study used the TAM instrument developed by Venkatesh and Davis (2000) to assess the technology preferences of the participants. Participants were asked to indicate their level of agreement or disagreement to statements presented to them. There were 29 statements used to assess four constructs: technology usefulness (four statements); technology ease of use (six statements); technology current use (nine statements); and

technology intentions (ten statements). Each item was scored on a four-point summated scale with anchors: 1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, and 4 = *strongly agree*.

For this study, construct validity was addressed by a team of researchers from Texas A&M University and University of Florida. Reliability was determined by calculating Cronbach's (1951) alpha coefficients *ex post facto* for each construct, yielding coefficients of .88 for technology usefulness, .81 for ease of use, .85 for current use, and .86 for technology intentions. Cronbach (1951) indicated that reliability coefficients of .80 or higher are acceptable. Bertrand and Bouchard (2008) utilised the TAM and reported a reliability coefficient of .87. Wu and Wang (2005) implemented the TAM in a study that produced a reliability coefficient of .93.

All public extension officers in Grenada, St. Lucia, and Belize were invited to attend a professional development workshop. The workshop formed part of a series of regional on-going in-service trainings provided by the University of West Indies that were mandatory for staff to attend. The main purpose of these trainings was to develop technical competencies. This particular two-day workshop was focused on using ICTs for programme planning and delivery. In each country all staff did not attend; however all present on the first day completed the questionnaire when asked. 55 (n = 55) extension officers responded in Grenada, 35 officers (n = 35) in Belize, and 29 officers (n = 29) in Saint Lucia. In all three countries, the sample reflected over 75% of the officers who were on duty at the time of the training.

Though the findings were not generalisable beyond the target population, the results do provide practitioners and researchers on factors that influenced extension officers' acceptance and use of technology to educate clientele. A limitation of the research includes potential response bias due to the 100% response rate as officers were a convenience sample mandated to participate in the ICT training.

The first objective of the study was measured with descriptive statistics. Fraenkel, Wallen, and Hyun (2012) indicated descriptive statistics enable researchers to describe respondents' answers to inquiries in terms of scores represented by means and standard deviations. Descriptive statistics explain group characteristics and reveal differences in attitudes towards variables (Fraenkel, Wallen, and Hyun 2012).

The second objective of the study was measured by analysis of variance (ANOVA). Researchers use ANOVA to determine if significant differences exist in the means of more than two groups (Fraenkel, Wallen, and Hyun 2012). An F value is used to interpret the variation between and within each of the groups in ANOVAs. A larger F value indicates a greater likelihood the variables have a statistical significance (Fraenkel, Wallen, and Hyun 2012). The resulting statistical analysis was set *a priori* at .05.

The majority of participants (n = 90, 75.90%) were male. Of the participants, 70 (n = 70, 58.82%) were between 19 and 40 years old, while 51 participants (44.70%) had earned an associate's degree, 58 participants (51.78%) had between one and ten years of work experience in agriculture. Nearly all the participants (n = 114, 99.10%) intended to make a career in agriculture, and 74 participants (64.30%) said they were very likely to stay in the field of extension.

Results

The first objective of the study was to describe Caribbean extension workers' technology preferences. Technology usefulness was the first construct that was examined

Table 1. Descriptive statistics for technology usefulness

Statements	*N*	*M*	*SD*
Using technology enhances the quality of my work	119	3.57	.68
Using technology enables me to accomplish tasks more quickly	119	3.51	.70
Using technology I can do much more work	119	3.49	.76
Using technology makes it easier to do my work	119	3.42	.72

Note: Overall $M = 3.50$ $SD = .72$. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

(see Table 1). The items that received the highest scores were 'Using technology enhances the quality of my work' ($M = 3.57$, $SD = .68$) and 'Using technology enables me to accomplish tasks more quickly' ($M = 3.51$, $SD = .70$).

Ease of technology use was the second construct examined in this study (see Table 2). The items that received the highest scores were 'I find it easy for me to become skilful in using technology' ($M = 3.37$, $SD = .73$) and 'I intend to use technology more in training sessions with my farmers/clients' ($M = 3.29$, $SD = .72$).

Technology current use was the third construct measured to answer the study's first objective (see Table 3). The items that received the highest scores were 'How many times in the last week have you used technology for personal contact?' ($M = 2.78$, $SD = 1.06$), 'How many times in the last week have you used technology to enhance your personal knowledge?' ($M = 2.77$, $SD = .96$), and 'How many times in the last week have you used technology for your personal tasks?' ($M = 2.69$, $SD = .95$). The lowest scores were received for the questions 'How many times in the last week have you used technology to store teaching materials?' ($M = 2.05$, $SD = .91$) and 'How many times in the last week have you used technology training materials?' ($M = 1.76$, $SD = .88$).

Technology intentions were the fourth construct examined to answer the study's first objective (see Table 4). The items that received the highest scores were 'I intend to use technology more for enhancing my knowledge' ($M = 3.64$, $SD = .53$), and 'I intend to use technology more in the future in all my work' ($M = 3.55$, $SD = .61$).

The second objective of the study was to describe any differences that existed in selected Caribbean extension officers' technology preferences according to personal characteristics (see Table 5). Highest level of education earned was the sole personal characteristic that effected technology preferences. Not all respondents reported the

Table 2. Descriptive statistics for ease of use

Statements	*N*	*M*	*SD*
I find it easy for me to become skilful in using technology	118	3.37	.73
I intend to use technology more in training sessions with my farmers/clients	117	3.29	.72
I find it easy to use technology	116	3.12	.71
I find it easy to use technology to do what I want to do	118	3.11	.73
I intend to use technology more to keep in touch with my farmers	119	3.11	.79
I intend to use technology more to get information out to my farmers	119	3.10	.85

Note: Overall $M = 3.18$ $SD = .76$. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

Table 3. Descriptive statistics for technology current use

Questions	*N*	*M*	*SD*
How many times in the last week have you used technology for personal contact?	118	2.78	1.06
How many times in the last week have you used technology to enhance your personal knowledge?	119	2.77	.96
How many times in the last week have you used technology for your personal tasks?	119	2.69	.95
How many times in the last week have you used technology to contact farmers and give your advice?	117	2.29	1.02
How many times in the last week have you used technology to assist your administrative tasks, communicating with your supervisors, colleagues, etc.?	119	2.28	1.03
How many times in the last week have you used technology to acquire the knowledge you need to enhance your training?	119	2.26	.89
How many times in the last week have you used technology to search for information when preparing your programmes?	119	2.16	1.03
How many times in the last week have you used technology to store teaching materials?	116	2.05	.91
How many times in the last week have you used technology to prepare training materials?	119	1.76	.88

Note: Overall $M = 2.11$ $SD = .97$. Scale: 1 = *0 times*, 2 = 1 – 5 *times*, 3 = 6 – 10 *times*, 4 = *over 10 times*.

highest level of education they had obtained. The result was $n = 114$ responded to the question regarding highest level of education earned.

There was a significant difference in education, $F(3, 110) = 5.29$, $p < .05$. The effect size was medium ($\eta^2 = .36$). Education accounted for 36% of the variance in technology current use. Tukey's post hoc analysis was conducted to determine if differences existed in levels of education. There was a significant difference ($p < .05$) between extension officers who had a primary/secondary level of education ($M = 2.00$, $SD = .50$) and extension officers who had earned a diploma ($M = 2.38$, $SD = .77$). There was a

Table 4. Descriptive statistics for technology intentions

Statements	*N*	*M*	*SD*
I intend to use technology more for enhancing my knowledge	118	3.64	.53
I intend to use technology more in the future in all of my work	119	3.55	.61
I intend to use technology more to acquire the knowledge I need to enhance my training	118	3.46	.66
I intend to use technology more for preparing training materials	117	3.40	.62
I intend to use technology more to search for information when preparing my programmes	118	3.38	.72
I intend to use technology more for my personal tasks	119	3.34	.74
I intend to use technology more to store teaching materials	117	3.27	.69
I intend to use technology more to assist my administrative tasks, communicating with my supervisors, colleagues, etc.	117	3.24	.74
I intend to use technology more for personal contact	117	3.20	.82
I intend to use technology more to contact farmers	118	2.97	.81

Note: Overall $M = 3.35$ $SD = .69$. Scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*.

Table 5. Analysis of variance for education and technology current use (N = 114)

	N	*M*	*SD*	*F*	*p*
Primary/secondary level	27	2.00	.50	5.29	.00*
Diploma	35	2.38	.77		
Associate degree	52	2.43	.58		

Note: *p < .05.

significant difference (p < .05) between extension officers who had earned a diploma (M = 2.38, SD = .77) and extension officers who has earned an associate's degree (M = 2.43, SD = .58). There were no other significant differences in personal characteristics (gender, age, work experience, agriculture as a career, and likelihood of remaining in extension) and technology preferences.

Conclusions

The results of this study indicated participants perceived that ICTs enhanced their work and provide increased efficiencies in carrying out their job functions. The participants further tended to agree that ICTs were relatively easy to use. The results correspond with Bertrand and Bouchard (2008) findings that participants believed ICTs were easy to use, and participants had intentions to use ICTs more in their respective position.

The data suggested while participants had access to ICTs and intentions to use the technologies for both professional and personal reasons, their current use was minimal. Extension officers with advanced degrees were more likely to report using ICTs than their less-educated colleagues. Data from this study was congruent with Wu, Hiltz, and Beiber (2010) in that individuals with more formal education used ICTs in their profession more compared to those who had earned less formal education.

Implications

Study participants indicated they intend to take advantage of ICT benefits for work in the future. The use of ICTs in the target population can help extension officers improve the quality and quantity of work being performed (Ganpat and De Freitas 2010). ICTs can be used to expand the scope of educational access to learners but also to benefit the knowledge and skills of educators (Robinson 2008). Officers were more likely to report they intended to use technology to expand their own knowledge. Extension officers recognise the value of technology for accessing information, but they were less likely to report intentions to use technologies with clientele. An opportunity exists to take advantage of the benefits listed above and increase the use of ICTs by extension officers within the context of their profession (Davis 1989). Extension officers' use of technology will be a vital requirement for their future work (Ganpat and De Freitas 2010).

This facet could be occurring because farmers in the countries studied may lack access to familiarity with technology. Officers may need training that demonstrates how to use technology to more efficiently share information from farmers (Fishbein and Ajzen 1975). The case may exist where offices may not have access to the technology because

extension officers reported they believed the technology was great and have intentions (Davis 1989) use technology more often.

The problem is occurring either because of external barriers or because of the perceived difficulty of use (Davis 1989). Perceived difficulty of use could be linked to education or functions of better-educated officers tend to get jobs in easier districts with better access to resources (Ajzen 1985). This finding underscores the need for training in order to increase extension officers' efficacy with using technology to teach farmers (Wu and Wang 2005).

Caribbean extension officers' educational backgrounds influenced their technological competency and likely other competencies as well. This finding underscores the need for professional development to build the capacity of officers lacking advanced degrees. ICTs could play an exceedingly essential role in enhancing the delivery of services to farmers in the Caribbean (Moberg 2005). Awareness and education are imperative to the adoption and diffusion of ICTs in the target population (Ovwigho et al. 2009). Institutional stakeholders must have knowledge of ICTs and the importance of these technologies for increasing their efficiency and productivity in relation to specific tasks (Sife, Lwoga, and Sanga 2007). Both the public and private sector can work to support further ICT development and application. Organisations must develop policy promoting technology adoption and innovation in developing countries (Romijn and Caniëls 2011).

Recommendations

The results highlight the absence of an educated and technologically proficient extension officer workforce. In countries where a great demand for extension exists, it is important to invest in raising the educational levels of staff. Extension officers with more formal education will use technology to teach and deliver educational information based on their beliefs and subjective norms of (Fishbein and Ajzen 1975). Officers with advanced degrees are better prepared to use ICT's, but opportunities to pursue advanced degrees are geographically limited. These results re-emphasise the importance of on-the-job capacity-building for extension officers, especially in countries lacking a major university.

Programme administrators need to develop an understanding of extension officers' use of technology to predict how much and how often extension officers will utilise ICTs to disseminate information to farmers. Extension officers need professional development training in employing ICTs currently available for their use. The increased ICT knowledge of extension officers should lead to more productive extension interactions with farmers. Increasing the use of technology to teach farmers may assist extension officers in producing a positive effect on product and knowledge trade in local communities (Hoekman, Maskus, and Saggi 2005). Caribbean farmers could be encouraged to engage in continuous extension learning opportunities with Caribbean extension officers who have developed an expert knowledge and understanding of available ICTs.

Future research should examine the lack of technology use by Caribbean extension officers. The data from this study indicated even though extension officers have technology, they only use the technology approximately twice per week. A future study could investigate whether Caribbean extension officers have access to technology or not. The same study could identify if Caribbean extension officers have the technology is the lack of knowledge the reason they are not using it. The data from the study presented here does not give us clear answers to these variables.

Caution is warranted against generalising the findings of this study beyond this particular population. Replication of the findings will provide more substantial proof of validity and generalisability (Gall, Gall, and Borg 2007). Conducting research in other English-speaking Caribbean countries could also be a useful means of determining what shared needs exist for extension officers, as economies of scale may be achieved by taking a regional approach to professional development. The results offer insights into the technology preferences of extension officers in the represented countries and the likelihood extension officers in the represented countries will use ICTs in the future to assist in educating clients.

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