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Factors Influencing the Use of and Attitude of using Information and Communication Technologies (ICTs) in Agricultural Extension, a Study in the Isfahan Province of Iran

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Abstract

Information and communication technologies (ICTs) are increasingly influencing human beings and are changing our attitudes towards these technologies. The purpose of this article is to understand the factors influencing the use of ICTs in agricultural extension through a descriptive research method. The populations were 320 individuals of agricultural Extension Workers (EWs) of Isfahan province that 200 people selected as a research sample. The reliability of self-completion questionnaire according to pilot test and calculating Cronbach's alpha for four part of the instrument was 82.6 - 87.8. The results revealed that the EWs have a positive attitude toward using ICT. They mostly viewed it as a useful tool for extension, which can potentially save money and time and extension. On the ranking of principal areas of applying ICTs by EWs "typing letters/report", "prepare and protect file on process basic agricultural and rural information", had most usage. The main result of the study revealed that the EWs approximately use ICT quite a bit. Also, the EWs with high school diploma degree used ICT less than the EWs with MSc degree and the EWs with 5 years and less experience had higher ICT application than the EWs with 15-16 year experience.

Keywords:
Agricultural extension, Information and Communication Technology (ICT), Attitude, Extension Workers, Iran

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INTRODUCTION

Information and Communication Technologies (ICTs) are steadily and increasingly influencing our daily lives and are changing our attitudes towards them (Kubiatko and Haláková, 2009). The emergence of new agricultural development paradigms has led to challenging the conventional methods of delivering important services to citizens and the transformation of traditional societies into knowledge societies. ICTs have been developed as a tool for achieving meaningful societal transformation, which is believed to provide a reliable network in agricultural sector (Meera *et al.,* 2004). ICTs can facilitate the processing and transmission of information electronically (Richardson, 2003).

The application of ICT in agricultural extension and rural development has significantly increased in several countries where it has provided a medium to adequate access to agricultural information (Richardson, 2003). ICT has been utilized as an extension tool, which has enhanced the information flow between agricultural extension services and their clients (Meera *et al.*, 2004).

Recent studies shows that agricultural extension should be looked at based on a communication network of different social actors (Leeuwis and Van den Ban, 2004).This depends largely on information exchange between and among farmers and a broad range of other actors through the Agricultural Knowledge and Information System (AKIS) (Omotayo, 2005). Extension workers at the grassroots level, who have direct links with farmers and other actors, are well positioned to make use of ICTs to access modern knowledge or other types of information that could facilitate the accomplishment of their activities.

In the process of ICT use in agricultural and rural development, extension workers (EWs) are considered as important stakeholders and a crucial part of extension development (Martin *et al.*, 2001). In a modern agricultural extension system, they need to know how to use ICTs for facilitating innovations. They should also be encouraged to develop positive attitudes towards the knowledge, experience and capacities of the local people (Amalu, 1998).Training may help these practitioners develop their ICTs competences. Many studies exist which have examined the role of training in the success of ICT implementation (Woodhouse and Baigent, 2002; Coulson, 2000; Small, 2001; Swann, 2003). Training can also encourage them develop positive attitudes towards using ICTs.

Computer or ICT attitude is described as a person's general evaluation or feeling towards computer related technologies and its related activities (Smith *et al.*, 2000). By measuring this attitude, we can examine users' interaction with computer hardware and software, other persons relating to computers, and activities that involve computer use. According to the Reason-Action theory (Ajzen and Fishbein, 1980), an association exists between human action and his attitude towards that action. There are some studies, which have noted the requirement of positive attitudes prior to implement ICTs (Adekunle *et al*., 2007; Spacey *et al*., 2003). The correlation between attitude toward technology and number of hours spent using a computer has been investigated in some research. They have also shown that initial computer experiences can influence the formation of computer attitude (Winter *et al.*, 1998; Kubiatko and Haláková, 2009).

Several studies have endorsed the positive relationship between teachers' attitudes and the relative advantage of using computers. The experiences in formal education shows the attitudes of teachers affect utilizing ICTs and how technological innovations are applied in education. This utilization is influenced by their own personal perspectives on the curriculum and on their pedagogical practices, which makes them feel more comfortable using ICTs and usually incorporate them into their teaching (Kersaint *et al.,* 2003; Lai *et al.,* 2001; Malcolm and Godwyll, 2009). Bullock's (2004) study supports one of the aspects of the diffusion theory explaining the influence of attitudes on the adoption of innovations (Rogers, 2003). This research identified that teachers' attitudes are a major enabling or disabling factor in the adoption of ICTs. Albirini (2004, 2006) indicated that high school EFL teachers in a large Syrian province had positive attitudes toward using ICTs in education. They considered computers as a viable educational tool with potentiality of improving their schools and classrooms. Soule (2008) identified the positive attitudes of faculty members toward ICTs, who were interested to spend time in designing, developing, and implementing technology integration in their classes. Adekunle *et al.* (2007) also revealed the positive attitudes of librarians in Nigeria towards using ICTs in their libraries, which was mostly linked to their understanding of the benefits of ICTs for them.

Some studies have also identified the positive

attitudes of students regarding online courses e-learning (Buzzetto, More, 2008; Hakkarainen *et al.*, 2000; Sandercock and Shaw, 2000; Spiceland and Hawkins, 2002; Yaghoubi *et al.*, 2008). The research of Sanders and Morrison-Shetlar (2002) examined student attitudes towards the Web-enabled learning component in a general biology course. They identified that the students' view was that this learning could have a positive effect on their learning, problem-solving skills, and critical thinking skills. Through an experimental research, McKinnon *et al.* (2000) identified that the experimental group students became more enthusiastic to computers and showed a better performance than the non-experimental group, though their enthusiasm was decreased in the 3 years' time. Cooper and Brna (2002) noted the factors of pleasure and variety as motivating factors, which can keep students engaged in curriculum and learning.

Investigations on ICT use and attitudes have also developed beyond only focusing on descriptive research. Through explanatory or relational investigations, they have tried to examine factors influencing ICT use or attitudes, such as gender, age, computer attributes and competence, cultural perceptions, location, and personal and organizational characteristics. For example, Kubiatko and Haláková (2009) identified boys had more positive attitudes towards using ICT in biology lessons than girls and the younger students had more positive attitudes in comparison with the older students. However, Sanders and Morrison-Shetlar (2002) examined female students responded more positively than males (fir the Web-enabled learning component in a general biology course). Albirini (2004, 2006) examined the relationship between teachers' attitudes and factors including computer attributes, cultural perceptions, computer competence, computer access, and teachers' personal characteristics. Sooknanan (2002) emphasized the "relative advantage" as the second most significant innovation characteristic in relation to teachers' attitudes. Isleem's (2003) study revealed that urban school teachers of Ohio were less positive and had less computer use than those in suburban schools (cited by Albirini, 2004). Davis (1998) also examined the relationship between teachers' attitudes and teachers' demographics variables, such as age, gender, educational level, grade taught, years of teaching experience, and prior computer use/ experience, and amount of computer training. In another investigation by Huang (2003), senior teachers showed less positive attitudes and were less willing to use them in their classes than fresh teachers.

Movahed and Iravani (2002) and Yaghoubi and Shamsayi's (2004) studies in agricultural faculties of Iran revealed that the academic members had positive opinion toward internet use. Their internet use was correlated to the characteristics of age, English language skills, computer skills, research activities, number of scientific publications, job status, field of study, access to the Internet, and their perceptions of Internet. Pouratashi and Rezvanfar (2009) identified that skills, support, and facilities influenced the application of ICT by agricultural students.

Investigations on using ICTs in agricultural extension are not as many as those described in education. However, some of them support the results mentioned above. The study of Annor *et al.,* (2006) revealed that extension agents had high and positive demands/attitudes towards using ICTs. They also showed high awareness regarding the advantages of using ICTs which could enhance the application of ICTs in extension.

Despite the potentials and the efforts made in many countries for developing ICTs in encouraging the acceptance of new agricultural technology, the Iranian agricultural extension service has not made a considerable progress in using this technology for its programs and in the process of its decision making. It is worth mentioning that ICTs can be regarded as a kind of information spreading means and as a golden opportunity for agricultural researchers, practitioners and policy makers. Nowadays, taking advantage of this opportunity which needs skill, knowledge, and appropriate devices is one of the most important necessities of this country. Our research tries to describe the existing ICT use and attitude of agricultural extension workers and determine their relationship with influencing factors.

Purpose and objectives

The overall purpose of this study was to investigate the attitude of Extension Workers (EWs) towards using ICTs in agricultural extension of Iran and the factors influencing these attitudes. The specific objectives of the study were to: 1) describe EWs demographic and job characteristics; 2) describe EWs' attitude toward using ICT; 3) understand the application of ICTs by the

EWs; and 4) determine the relationship between demographic and job characteristics and the attitude toward using ICT.

MATERIALS AND METHODS

This study utilized a descriptive-relational research design using a survey methodology. The investigating research populations were 320 individuals of agricultural Extension Workers (EWs) of Isfahan province among whom 42 individuals were located in the agricultural organization of Isfahan province and the branch of the county management (N=70), were studied by census. For the selection of the required sample of the centers of providing agricultural services, the appropriate stratified sampling method was used that 200 answered a self-completion questionnaire were returned, totally.

An instrument was applied to measure and investigate the required variables, which was divided into two parts. Part one consisted of 23 statements measuring the EWs' attitudes toward using ICT in agricultural extension using a five-point Likert-type scale (ranged from 1 indicat-

Table1: Frequency and Percentage for Demographic and Job's Characteristics

Demographics Profile	f	%
Gender	154	87.0
Male	23	13.0
Female	177	100.0
Total		
Age*	42	23.5
30 years and less	64	35.8
31 – 40 years	63	35.2
41 – 50 years	10	5.6
51 years and more	179	100.0
Total		
Highest education completed	18	10.2
High school diploma	33	18.6
Bachelors of art	104	58.8
Bachelors of science	22	12.4
Masters of science	177	100.0
Total		
Major area of study	17	9.5
Extension and education	50	27.9
Agronomy	21	11.7
Animal science	64	35.8
Other agricultural majors	27	15.1
Not related to agricultural major	179	100.0
Total		
Work experience in agricultural extension**	75	41.2
5 years and less	68	37.4
6 – 15 years	39	21.4
16 years and more	182	100.0
Total		
Work location	36	19.7
Provincial level	51	27.9
District (Shahrestan) level	96	52.5
County (Dehestan) level	183	100.0
Total		
Employment	87	48.9
Tenured	91	51.1
Tenured track	178	100.0
Total		

*Mean of age = 37.83, SD = 8.16 and range between 23 to 55 years old.
** Mean of work experience = 9.42, SD = 7.57 and range between 1 to 29 years of experience.

Table 2: Attitude toward ICT Use in Agricultural Extension

Attitude	n	Mean*	S.D	Rank
Will increase the technical knowledge of extension and education (EE)	183	4.15	0.55	1
It is a useful tool for extension	183	4.31	0.7	2
Enhance quality of extension activities	180	4.18	0.69	3
Potentially saves money sources	183	4.27	0.75	4
Potentially saves time	183	4.27	0.75	5
Can be used as teaching aids in extension training	183	4.21	0.75	6
Help deliver up-to-date and online information	180	4.13	0.74	7
Has no influence on extension activities effectiveness **	179	4	0.72	8
Offers flexibility of location for delivery extension programs	181	3.81	0.71	9
Facilitate delivery of information to clientele	179	3.94	0.76	10
Potential for too much information to farmers	182	3.82	0.74	11
Offers flexibility of time for delivery extension programs access to information	183	3.78	0.73	12
Help exchange EE's ideas in regard to farmer's problem solving	183	4.08	0.83	13
Increases the linkage between researchers and EE	180	3.92	0.8	14
Increases the linkage between extension and farmers	183	4.04	0.88	15
Has no influence on extension activities effectiveness **	183	4.01	0.94	16
Information through ICT does not need for other published source	183	3.71	0.85	17
Accuracy of ICT information is questionable **	181	3.6	0.9	18
Learning ICT is hard for EE	181	3.53	0.92	19
EE possess skills for effective use of ICT	183	3.49	1.03	20
Too much information from ICT makes the information less Useful	183	3.32	1.05	21
Too costly to extension	182	2.75	0.96	22
Makes EE job demands less	183	2.3	0.97	23
Summated Score	**183**	**86.17**	**7.17**	

* Mean computed on a scale 1 = SD to 5 = SA and could range from a low of 23 to high of 115 with
** Recode theoretical midpoint of 68
Scale:1= Strongly Disagree, 2 = Disagree, 3 =Undecided, 4 = Agree and 5 = Strongly Agree

ing as "Strongly Disagree" to 5 as "Strongly Agree."). The responses were reduced to a mean score ranging between 1 and 5 (higher scores indicating more positive attitudes) that demonstrated how positive/negative each respondent's attitude toward ICT was. The part two of the questionnaire was designed to identify demographic and job's characteristics including gender, age, education level, major area of study, work experience, current work location, and employment status.

The instrument was assessed for content and face validity by a panel of experts consisting of faculty members in the Departments of Agricultural Education and Extension, Penn State University and the extension officers of the Esfahan Province Agricultural Jihad Organization. The instrument was pilot tested by the responses of 30 EWs in Isfahan Province who were excluded from the population. This helped us make minor changes to improve the clarity and readability of the instrument. The Cronbach's alpha test, an internal consistency measure, was used to estimate the reliability, which showed that the reliability coefficient for part one (attitude toward ICT usage=0.80) and two of the instrument (ICT application=0.84) was 0.82. This is considered to be very acceptable level of reliability for research purposes. Data were collected via a postal technique, through which 200 self-completion questionnaires were mailed to the respondents. 110 (55 %) were returned within four weeks. Then, follow-up questionnaires were sent to non- respondents, which led to receiving an additional 75 responses. In total, 183 (91.5 %) questionnaires were received, which were used for descriptive and inferential data analyses such as frequencies, percentages, means, standard deviation, correlations and analysis of variance tests. F-test was used to determine differences of the EWs' attitudes in terms of demographic and job characteristics. The Pearson Product Moment Correlation test was utilized to describe the relationships. The scale developed by Davis (1998) was employed to describe the magnitude of the relationships.

RESULTS

The majority of the respondents were male (see Table 1) and the respondents' age was distributing evenly among three groups (23.5% under 30 years; 36.0% between 31-40 years and 35.0 %

Table 3: F- Test results for attitude toward using ICT examined by major area of study, extension experience and work location

Variable	n	Mean	S.D.	F	P
Major of study*					
Agronomy/extension education	68	87.55	6.48		
Other agriculture major	85	86.48	6.75	3.9	0.022
Not agriculture major	27	83.18	8.14		
Educational degrees**					
High school diploma	18	81.94	28.89		
Bachelors of art	36	104.69	14.76	6.57	0.000
Bachelors of science	105	103.53	17.69		
Masters of science	30	101.93	26.7		
Work experience in extension***					
5 years and less experience	75	88.91	5.8		
6 – 15 year experience	68	84.54	7.8	10.36	0.000
16 years and more experience	39	83.74	6.93		
Work location					
Provincial level	36	83.89	7.89		
District (Shahrestan) level	51	86.12	7.35	2.59	0.078
County (Dehestan) level	69	87.05	6.83		

Note. Scheffé post hoc test results revealed significant differences as follow:
*For major area of study, the first and second groups have higher attitude toward using ICT.
**For Educational degrees, MSc group had higher attitude than high school diploma degree group.
***For work experience, the first group has higher attitude than the second and third groups.

between 41-50 years). Three of five respondents (59%) had completed the Bachelor of Science degree. Nearly 28% reported agronomy as their major of study followed by a major other than agriculture (15.1%). 11.7 % had studied in animal sciences and only 9.5 % had agricultural extension and education degree. A little over one-third of the respondents (35.8%) indicated their major area of study in other agricultural subjects such as farm machinery, plant pathology, food science, irrigation engineering, and horticulture. On average, respondents had 9.4 years of work experience and a little over one-half of the respondents (52.5%) had worked in offices at county level. Employment status of respondents was more or less evenly divided among the tenured (49.0%) and the non-tenured (51%) personnel.

Attitude toward using ICT

This part of the survey assessed the extent of respondents' agreement with 23 items measuring EWs' attitudes toward using ICT in extension (see Table 2). Based on a Likert type scale (1= Strongly Disagree, 2 = Disagree, 3 =Undecided, 4 = Agree and 5 = Strongly Agree), their responses showed both positive and negative views about the impacts of ICT in extension services. The grand mean of 4.31 (SD = 0.70) regarding "ICTs as a useful tool for extension" and the total mean of 86.17 (SD=7.17) computed by the 23 items revealed that the EWs tended to have positive attitudes toward using ICT. The EWs mostly viewed ICTs as a useful tool for extension which could enhance the quality of their activities and save time and money.

Relation of demographic and job characteristics with attitude toward using ICT

Significant differences of attitudes were investigated among different major area of study and among different work experience (Table 3). The ANOVA was utilized to identify the differences following Scheffé post-hoc analysis to analyze the differences between groups. The ANOVA showed significant differences [F = 3.90; p = .022] among different major areas of study, in which the EWs with extension and education and agronomy degrees had much more positive attitude toward using ICT than other groups (see Table 3). The Scheffé post-hoc analysis also showed the EWs with MSc degree had more positive attitude toward using ICT than those with high school diploma degree. Moreover, significant differences [F = 10.36; p = .000] were found between the EWs in terms of different work experiences in extension. The EWs with "5 years and less" experience were more in favor of using ICT than those with more experiences (see Table 3).

Application of ICT in agricultural extension by EWs

This part of the survey concerned the principal

Table 4: ICT Application by EW in their Job

ICT Application	n	Mean*	S.D.	Rank
Typing letters/reports	183	3.24	0.92	1
Prepare and protect file on process basic agricultural and rural information	181	2.89	0.87	2
Access to the latest agricultural news and information	183	3.00	0.97	3
Upgrade EW's professional competencies	183	2.70	0.92	4
Prepare and present published brochure needed at the local level	183	2.83	0.98	5
Improve the administrative information activities at regional level	183	2.67	0.93	6
Record and exchange of information in regard for extension centers	182	2.84	0.99	7
Document activities and extension programs delivered	183	2.69	0.95	8
Improve accessibility of EW to agricultural specialized resources	181	2.80	0.99	9
Summarize information using figures and charts	183	2.66	0.95	10
Prepare slides through multimedia software	183	2.61	1.04	11
Increase the speed of EW's information acquisition from research	183	2.70	1.08	12
Prepare short video films through multimedia Software	183	2.62	1.05	13
Improve EW's skills	182	2.35	0.95	14
Learn about presentation skills for conferences/seminars	183	2.62	1.06	15
Improve discussion among EW through computer network	183	2.41	0.99	16
Facilitate accessibility to legislative information	182	2.51	1.04	17
Updates administration rules	182	2.51	1.04	18
Improve linkages between EW and researcher	181	2.37	1.03	19
Present group training to farmers through video conference	182	2.33	1.00	20
Present advisory services to different farmer groups	182	2.24	1.02	21
Summated score	**183**	**55.45**	**15.89**	

* Mean computed on a scale 1 = not at all, 2 = slightly, 3 = quite a bit, and 4 = very much

Table 5: Comparing ICT application in terms of education and work experience

Variable	n	Mean	S.D.	F	P
Educational degrees*					
High school diploma	24	47.17	16.34		
Bachelors of art	36	61	16.61	3.93	0.009
Bachelors of science	133	55.21	15.61		
Masters of science	31	52.19	16.3		
Work experience in extension**					
5 years and less	97	57.21	15.57		
6-15 years	64	50.89	16.84	3.43	0.034
16 years and more	45	57.24	15.89		

Note. Scheffé post hoc test results revealed significant differences as follow:
Scale: scale 1 = not at all, 2 = slightly, 3 = quite a bit, and 4 = very much
*ICT application: bachelors of art > high school diploma.
**ICT application: 5 years and less of experience > 6 – 15 years.

areas of applying ICTs by EWs in extension and identified from previously reported research findings. EWs responded to 21 items using the following type scale: 1 = not at all, 2 = slightly, 3 = quite a bit and 4 = very much.

A summery is shown in Table 4. It shows means and standard deviations for each of the 21 ICT applications. The statements which the respondents used most were: "typing letters/report" (M=3.24, SD=0.92), and "Prepare and protect file on process basic agricultural and rural information"(M=2.89, SD=0.87), and "access to the latest agricultural news and information" (M=3.00, SD=0.97). Overall, the result of the Mean (55.45), and Standard Deviation (15.89), indicate that the EWs in the study approximately use ICT quite a bit.

The score of these 21 items were computed. Its mean was calculated to be 55.45 (SD=1.02) out of 126 which shows almost a low use of ICT. The EWs had different level of using ICT in terms of their different educational degrees [F = 3.93; p = .009] and their work experience (F = 3.43; p = .034) (see Tables 5). According to the Scheffé post-hoc analysis, the EWs with high school diploma degree used ICT less than the EWs with MSc degree. The EWs with 5 years and less experience had higher ICT application than the EWs with 15-16 year experience.

CONCLUSION AND DISCUSSION

The study identified that the EWs have positive attitudes toward using ICT, though their existing use was almost low. This corresponds to similar studies conducted in Iran and other countries (for example Adekunle *et al*., 2007; Albirini 2004, 2006; Annor *et al.,* 2006; Hakkarainen *et al.,* 2000; McKinnon *et al*., 2000; Sandercock and Shaw, 2000; Sanders and Morrison- Shetlar, 2002; Soule, 2008; Spiceland and Hawkins, 2002; Yaghoubi *et al*., 2008). The EWs in our research mostly viewed the ICT as a useful tool for extension, which can potentially save money and time and improve its productivity.

Their ICT application and their attitudes towards using ICT were related to their major area of study (which was interrelated to their knowledge of extension), educational degree and agricultural extension work experience. Therefore, these factors are important indicators influencing ICT attitude. Major area of study reflects their knowledge of extension and agriculture. The EWs with the areas of agronomy, extension education and other agricultural subjects have more positive attitude toward using ICT than others. This shows they may perceive the potential application of ICT more than others. However, the research does not support studies of Movahed and Iravani (2002) and Yaghoubi and Shamsayi (2004) regarding the relationship between Internet usage and major of study.

Significant relations were investigated between experience and ICT application and attitude toward using ICT, which supports some studies about the relation between experience and ICT attitude (such as Davis, 1998; Huang, 2003; Miller and Miller, 2000; Sadik, 2005; Samak, 2006; Soule, 2008) as well as some studies about the association of experience with ICT use, for example Mohamadi (2002) and Zamani (2004). The EWs who have lower experience (5 years and less experience) have more ICT application and more positive attitude toward using ICT than the EWs with higher experiences. This may be because the younger generations are more exposed to ICT.

Despite the significant differences between work location and attitudes toward using ICT identified in some studies (Isleem, 2003), our study indicated no significant differences between these two variables, which supports the Albirini's (2004) results.

ICT use and attitude toward its use are associated with educational degrees of the extension personnel. This is similar to the studies of Sooknanan (2002); Saadi, Movahedi, and Nagel (2006); Maningas and Mancebo (2002); Movahed Mohammadi (2002); Mohammadi (2002); Al-Motrif (2000); Falaki (2005); and Fallah Haghighi (2006). However, this does not support the findings suggested by Rasouli Azar (2005). The EWs with MSc degree indicated higher level ICT application and more positive attitudes toward using ICT than the EWs with high school diploma. Therefore, education level can be an important indicator of ability to use ICT and understanding the importance of ICT.

RECOMMENDATIONS

The rapid diffusion and adoption of ICT have created both promises and challenges for most developing countries such as Iran. On one hand, for most ICT is a promising mechanism for national development, and, on the other, it necessitates new capacity building and development in human resources, and in Agricultural extension. A key element that has been left out and stimulated the authors is to understand the attitudes of the Extension Workers (EWs) toward these new tools. According to the results, the policy makers and planning programmers should much more efforts to offer and organize pre-service or in-service training courses for this matter. They also need to facilitate required infrastructure and change administrative procedures. It is essential to sustain and promote EWs prior to or along with establishing this costly technology initiatives. They should try to alleviate some EWs' concerns who viewed the side-effects of culturally incompatible contents of some web pages. A careful need assessment regarding ICT and its relevant contents is required, especially in terms of factors such as educational level, area of study, geographical level, experience, work type and other work-related characteristics.

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