Determinants of ICTs in Agricultural Extension System

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ABSTRACT

Attitude is an individually attributed emotion, belief of behavioural tendency an individual has towards a specific abstract or concrete object. Attitude is defined as the degree of positive or negative affect associated with some psychological object. The effective use of ICTs in agricultural extension system is affected by many factors which are directly or indirectly related with the extension personnel. Therefore, an effort was made to study the factors determining the attitude of agricultural extension personnel towards the use of ICTs in agricultural extension system in Ranga Reddy district of Andhra Pradesh to know about the factors affecting the attitude of agricultural extension personnel towards the use of ICTs in agricultural extension system. Total 180 respondents were studied for the study. Results show that the independent variables viz-, education, number of years of service, possession of smart gadgets, sources of awareness about ICTs, methods of learning ICTs, trainings received, innovativeness, scientific orientation, information management orientation and orientation towards extension service profession are positively and significantly correlated with attitude of agricultural extension personnel towards use of ICTs in agricultural extension system whereas age is negatively and significantly correlated. Thus, the factors which are positively governing the attitude of extension personnel towards use of ICTs in agricultural extension system should be well taken care to promote efficient use of ICTs in agricultural extension system.

Key words : *Attitude; Extension personnel; Information and communication technologies; Extension system;*

Agricultural Extension, in the current scenario of a rapidly changing world, has been recognized as an essential mechanism for delivering knowledge (information) and advice as an input for modern farming and the role of ICT in actualizing so has drawn interest of practitioners (*Richardson, 2003*). Information and communication technology (ICT) in agriculture is an emerging field focusing on the enhancement of agricultural and rural development in many countries (*Anonymous, 2006*). Various studies on ICTs also reflect that ICTs offer opportunities to reach more people and to carry out various functions within extension systems more effectively and efficiently. It can provide easy access to local or global information and knowledge and are simple channels for two-way communication. The development in telecommunications has enormous impact on the applications of ICTs and their uses. Telecommunication infrastructures in particular have become the driving forces of ICTs; they have the capability to link various ICT elements together irrespective of locations and to provide a converging platform for these elements. *Omotayo (2005)* observes that frontline extension workers who become the direct link between farmers and other actors in the extension of agricultural knowledge and information systems are well positioned to make use of ICT to access expert knowledge or other types of information that could facilitate the accomplishment of the farmers' routine activities. It could be understood that in modern times ICTs are the strong linkage between research and extension system and it becomes imperative to study the factors which are determining the attitude of agricultural extension personnel towards the use of ICTs in extension system.

METHODOLOGY

The present study was conducted in Ranga Reddy district of Andhra Pradesh purposively as it is one of the major states where a number of ICT projects are being implemented. A proportionate number of

respondents were selected both from public and private sectors. Respondents from State Department of Agriculture, Ministry of Agriculture-National Institute of Agricultural Extension Management (MANAGE) GOI, State Agricultural University-Acharya N G Ranga Agricultural University (ANGRAU), ICAR institutes, were selected purposively for the study under public organizations. Respondents from Nagarjuna fertilizers, ETV, TV5, e-choupal (ITC) etc. were selected purposively for the study under private sector. Research and development (R&D) sector has respondents from State Agricultural Universities (ANGRAU)-KVKs, DAATTCs (District Agricultural Advisory Transfer of Technology Centres) and ICAR institutes. So, a proportionate sample of 60 respondents was selected randomly respectively each from State Department, Research and development (R&D) sector and Private Organizations for the study. Thus a total of 180 respondents were selected for the study.

RESULTS AND DISCUSSION

Personal Profile of the Respondents: Personal profile of the respondents has the basic information on age, gender, education, nativity, number of years of service and major job responsibility area. The same is presented in Table 1.

It is clear from the table that slightly more than half (51.67%) of the respondents were young followed by middle (28.33%) and old age (20.00%). With respect to gender, it is evident from the table that about 65 per cent respondents were male while only about 35 per cent respondents were female. Although the percentage of male is more in comparison to the female, still the percentage of women, who had experience in using ICTs, is encouraging. With respect to educational status of the respondents, majority of them were post-graduate (60.56%) followed by doctorates (21.11%) and graduates (18.33%). The percentage of the graduate respondents in the present study was high in State Department of Agriculture. Not a single respondent from Research and Development (R&D) and private sector was belonged to graduate category because they should be either post-graduate or the doctorate as the minimum educational criteria for R&D and private sector was post-graduate. In the area of nativity, majority (36.11%) of the respondents belonged to urban area followed by rural (32.78%) and semi-urban (31.11%). Number of years of service was categorized as low, medium and

Table 1. Personal profile of the Respondents working in R&D, SDA and Private sector

Characteristics	Category	R&D Sector (n=60)	SDA (n=60)	Private Sector (n=60)	Total (N=180)
Age	Young	18 (30.00)	36 (60.00)	39 (65.00)	93 (51.67)
	Middle	20 (33.33)	13 (21.67)	18 (30.00)	51 (28.33)
	Old	22 (36.67)	11 (18.33)	03 (05.00)	36 (20.00)
Gender	Male	39 (65.00)	36 (60.00)	41 (68.33)	116 (64.44)
	Female	21 (35.00)	24 (40.00)	19 (31.67)	64 (35.56)
Education	Graduate	00 (00.00)	33 (55.00)	00 (00.00)	33 (18.33)
	Post graduate	25 (41.67)	27 (45.00)	57 (95.00)	109 (60.56)
	Doctorate	35 (58.33)	00 (00.00)	03 (05.00)	38 (21.11)
Nativity	Rural	22 (36.67)	25 (41.67)	12 (20.00)	59 (32.78)
	Semi-urban	16 (26.67)	17 (28.33)	23 (38.33)	56 (31.11)
	Urban	22 (36.67)	18 (30.00)	25 (41.67)	65 (36.11)
No. of years of service	Low (less than 5 years)	31 (51.67)	40 (66.67)	36 (60.00)	107 (59.44)
	Middle (5 to 10 years)	14 (23.33)	13 (21.67)	13 (21.67)	40 (22.22)
	High (more than 10 years)	15 (25.00)	07 (11.67)	11 (18.33)	33 (18.33)
Major job responsibility area	Extension	32 (53.33)	53 (88.33)	41 (68.33)	126 (70.00)
	Research	14 (23.33)	00 (00.00)	10 (16.67)	24 (13.33)
	Training	11 (18.33)	00 (00.00)	09 (15.00)	20 (11.11)
	Administration	03 (05.00)	07 (11.67)	00 (00.00)	10 (05.56)

Figures in parentheses indicate percentage

R&D = Research and Development ; SDA = State Department of Agriculture;

high. Majority of the respondents fall into low category of years of service (59.44%) followed by medium (22.22%) and high (18.33%). The low percentage of number of years of service might be due to the reason that majority of them belonged to the young age category. The major job responsibility area was the area where the respondent was giving their services to a major portion. It was categorized as extension, research, training and the administration. From the table, it is clear that majority (70.00%) of the respondents belonged to the area of extension as the major job responsibility followed by research (13.33%), training (11.11%) and administration (05.56%).

Thus it could be concluded from the Table 1 that majority of the respondents were young, male, post graduate, belong to urban area, falling into low category of service and extension as the major job responsibility area.

It could be seen from Table 1 that from the R&D sector, majority (36.37%) of the respondents were of old age followed by middle (33.33%) and young (30.00%) whereas in SDA, majority of the respondents belong to young age (60.00%) followed by middle (21.67%) and old age (18.33%). The same trend was observed in private sector i.e. majority of the respondents (65.00%) were young followed by middle (30.00%) and old age (05.00%). The reason of variability in terms of age between R&D sector, SDA sector and Private sector respondents may be due to minimum educational criteria to be employed in the respective departments.

With respect to gender, same trend was found in R&D sector, SDA and private sector. Majority (65.00%) of respondents from R&D sector were male followed by female (35.00%). In SDA, majority of the respondents were male (60.00%) followed by female (40.00%). About 69 per cent respondents were male followed by female (31.67%) from private sector. It is evident that the percentage of women taken for study was more in R&D and SDA in comparison to private sector. The reason behind this difference might be due to more work specialization focus in R&D and SDA in comparison to private sector.

The educational status of the respondents' shows that from R&D sector not a single respondent was graduate. Majority (58.33%) of the respondents were doctorate followed by post-graduate (41.67%). The reason of absence of exclusive graduate respondents is the minimum essential educational level of entry to the occupation was post-graduation. In SDA, a slightly more than half of the respondents were graduate (55.00%) followed by post-graduate (45.00%). Not a single respondent from SDA was doctorate. The reason might be that the minimum essential qualification to entry into the SDA is graduation, so the higher education is not seen in comparison to R&D and private sector. In private sector also, majority of the respondents were post-graduate (95.00%) followed by doctorate (05.00%). Not a single respondent was found graduate in private sector as well as in R&D sector.

With regard to number of years of service, from R&D sector, a slightly higher than half of the respondents (51.56%) belonged to low years of service followed by high (25.00%) and middle (23.33%). About 67 per cent respondents from SDA were falling into low category of number of years of service followed by middle (21.67%) and high (11.67%). From private sector, 60 per cent respondents were falling into low years of service followed by middle (21.67%) and high (18.33%).

In R&D sector, majority (53.33%) of the respondents were involved in extension followed by research (23.33%), training (18.33%) and administration (05.00%). About 89 per cent respondents from SDA sector were involved in extension followed by 12 per cent respondents major job area was administration. Not a single respondent from SDA was involved in either research or training as major job responsibility. About 69 per cent respondents from private sector were involved in extension followed by research (16.67%) and training (15.00%). Not a single respondent was in administration side of the job.

So, it could be summarized from the table that in R&D sector, majority of the respondents were old, male, doctorate, hailing from both rural and urban areas, have less experience in job and extension was the major job responsibility. From SDA, majority of the respondents were young, male, graduate, hailing from rural areas, fall into low category of number of years of service and extension was the major job responsibility. From private sector also, majority of the private sector respondents were young, male, post graduate, hailing from urban areas, have less years of service and extension was the major job responsibility.

Factors determining the use of ICTs in agricultural extension system : To know about the major factors contributing to attitude of extension personnel towards use of ICT in agricultural extension system, multiple regression analysis and step down regression analysis were used and the findings are presented in Table 2.

It was evident from the table that the independent variables viz., education, number of years of service, possession of smart gadgets, sources of awareness about ICTs, methods of learning ICTs, trainings received, innovativeness, scientific orientation, information management orientation and orientation towards extension service profession are positively and significantly correlated with attitude whereas age is negatively and significantly correlated with the attitude of extension personnel towards use of ICTs in agricultural extension system.

The variable age was found to be negatively correlated with attitude of the total respondents at 5 per cent level of significance and the same results was found with the respondents of R&D sector. But it was found non-significant with SDA as well as private sector respondents. The overall trend is seems to be that age negatively associated with the attitude of the respondents towards use of ICTs. This might be due to the fact that young people are in the forefront of technological revolution and majority of the youth are depending on the use of computers and internet for personal as well as official purposes. Still the elder people has resistance in the use of ICTs because of lack of e-skills hence they might have developed negative attitude towards use of ICTs in turn they mostly depend on younger ones for their work, if any.

Education was found positively correlated with attitude of the respondents in the use of ICTs and found significant at five per cent level of significance. The same trend was found with R&D sector respondents but found non-significant with SDA and private sector respondents. The present education system is providing IT skills for the individuals to make them competitive in global digital economy. Now-a-days almost all the agricultural universities have designed and developed the e-learning programmes or courses to make the agricultural graduates more competitive in the use of ICTs in the profession of agricultural and allied sectors. Hence, this result indicated that education of the respondents might have helped them to develop positive attitude towards use of ICTs in extension activities. The findings are supported with the work done by *Rogers (2003)*.

Table 2. Determining factors for attitude toward use of ICTs in Agricultural Extension System

Variables	Attitude			
	R&D (n=60)	SDA (n=60)	Private (n=60)	Total (N=180)
Age	-0.295*	-0.120	0.019	-0.387*
Gender	-0.085	0.040	0.180	0.002
Education	0.401*	0.054	-0.018	0.283*
Nativity	0.054	0.120	-0.152	0.037
No. of yrs. of service	0.160	0.281*	-.0117	0.444*
Possession of Smart Gadgets	-0.059	0.334*	0.227*	0.232*
Sources of awareness about ICTs	0.461*	-0.110	-0.056	0.365*
Perceived attributes of ICTs	0.275	0.261	-0.230	0.216
Methods of learning ICTs skills	0.271*	-0.032	0.161	0.259*
Trainings received	0.318*	0.281*	0.650*	0.241*
Achievement motivation	-0.166	0.084	0.155	-0.043
Innovativeness	0.014	-0.003	0.453*	0.490*
Economic motivation	0.044	0.167	-0.062	0.041
Management orientation	0.039	0.018	0.058	0.027
Scientific orientation	0.247*	0.343*	0.296*	0.404*
Risk orientation	-0.036	-0.199	0.086	-0.031
Technology management orientation	0.189	-0.161	0.208	0.136
Information management orientation	0.213	-0.111	0.383**	0.204**
Orientation towards ext. service profession	0.078	0.169	0.376**	0.162*

** Significant at 0.01 level
*Significant at 0.05 level

The respondents' number of years of service was found positively correlated with attitude of the respondents towards use of ICTs and it was found significant at five per cent level of significance. The same result was observed with respondents of SDA sector but non-significant with R&D sector and private sectors. Generally more service or experience in the job will provide plenty of opportunities to face or tackle or to do different activities related to their job work. All are directed

towards reach the targets and achieve the setting goals.

In this e-working culture, definitely ICTs are the important tools and they have challenges and targets and they have to work for the organization, hence this might have helped them to develop the positive attitude towards use of ICTs.

As a total, the attitude of the respondents was positively correlated with possession of smart gadgets by them at five per cent level of significance and the same was with respondents of SDA and private sector. ICT has become a very important feature of Indian agriculture sector in contemporary times. The farmer's information needs can be addressed by a combination of push pull ubiquitous technology such as smart phones, interactive video response system, internet, kiosks etc. when these smart gadgets abled the respondents to deliver the agricultural information effectively to farmers and helped them to do their different job activities effectively, this process might have helped them to develop positive attitude towards use of ICTs in their profession.

Awareness and sensitization of extension personnel is a necessary step in developing ICTs in organizations. The rise in level of awareness of individual towards ICTs use will not only depend on the organizations efforts but also with the different other sources wherein the individuals come across with them. In this study this variable was found significant and positively correlated with attitude at five per cent level of significance and the same result was found with the respondents of R&D sector but non-significant with SDA and private sectors. More sources of awareness lead to higher awareness and this might have helped the respondents to have positive attitude towards use of ICTs in terms of time, cost, easiness and effectiveness of ICTs in their job.

According to attribute function theory, attitudes are formed, maintained and changed in order to satisfy personal needs and achieve psychological benefits. Accordingly, one possesses attitudes for different reasons. Generally, the knowledge on the perceived attributes of an innovation will influence the individuals to develop positive or negative attitude towards it which in turn lead to adoption or non-adoption. Evidently, it was clear from the Table that the variable i.e., perceived attributes of ICTs was positively significant at five per cent level of significance with the attitude of the respondents towards use of ICTs in their job and the same trend was observed in all the sectors i.e. R&D, SDA and private sectors. This is an important finding because positive attributes of ICTs will help in large scale adoption in agricultural extension system by all the stakeholders for effective information acquisition, processing, storing and dissemination.

Generally, there are two approaches of e-learning by the learners; one is 'learning without technology' support (books, printouts, library, face to face, TV, video/ DVD etc.) and the second one is 'Technology enhanced learning' (e-mail, internet, online discussion, video conference etc. Effective learning depends on the methods of learning ICTs skills and hence, this variable was positively and significantly correlated with the attitude of the total respondents at five per cent level of significance and the same result was found with the R&D respondents but non-significant with SDA and private sector.

Trainings on ICTs are fundamental to the implementation of e-extension/cyber extension in agricultural development. It offers great opportunities to access ICTs, readers inequalities among staff in ICT use and improve quality and effectiveness of extension advisory system. So, training and professional development in ICTs will contribute towards the meaningful use of ICTs in agricultural extension. As extension personnel become more conversant with ICT use through number of trainings they can learn to harness its potential and lead to develop positive attitude towards ICTs. This support the results in this study that the trainings was positively significant at five per cent level with attitude of extension personnel in ICTs use and it was also found the same in all the sectors i.e. R&D, SDA and private. The findings are supported by the study done by *Woodhouse and Baigent (2002), Coulson (2000), Small (2001)* and *Swann (2003).*

The variable innovativeness was found to be positively correlated with the attitude of total respondents in the use of ICTs at five per cent level of significance and the same trend was evident in private sector individuals. Innovativeness leads to use of ICTs. They are able to adopt despite a high degree of uncertainty about the ICTs at the first time usage and are willing to accept an occasional setback when a new ICTs proves unsuccessful. If any ICTs prove successful, they will

become leaders or path breakers to other members of organization or system which will help to develop positive attitude towards ICTs use in agricultural extension system. In this study this might have one of the reasons to support the results.

Scientific orientation is one of the fundamental notions of the process character of reality. Scientific orientation of an individual will help him in use of modern technologies developed on the basis of principles of science rather than use of traditional and routine technologies. This is individual's intelligence and belief in science. Scientific orientation will help the people to develop positive attitude towards modern technologies and the same was found in this study to be significant at five per cent level of significance. The attitude of the extension personnel in the use of ICTs in all the three sectors i.e. R&D, SDA and private was positively significant with scientific orientation of the respondents.

Information management orientation was found significant at one per cent level of significance and positively correlated with attitude of the total respondents in the use of ICTs. Information management orientation will facilitate the employee in learning the key information management principles and to investigate the proliferation of information management practices today for organizational learning. It helps in understanding the information acquisition, processing, storing and dissemination and this is the most appropriate in agricultural system. In this study, usage of ICTs in information management might have resulted positive effect in organization or individual job performance, hence positive attitude towards usage of ICTs in agricultural extension.

The variable orientation towards extension profession was positively and significantly correlated at one per cent level of significance with attitude of the total respondents towards use of ICTs and the same result was found at five per cent level of significance in private sector. Only in R&D and SDA sector, it was found non-significant. No doubt, extension profession is a service oriented profession in terms of helping poor farming community. This orientation towards extension profession might be at low level in public sector i.e. R&D and SDA, hence the resulted non-significant relation with attitude of usage of ICTs. As per the above results, it cannot be taken granted that respondents of private sector were having the service oriented approach towards extension. This might be because of target/ profit oriented approach to cater their targets/profits in the job might have resulted in effective usage of ICTs which in turn might have leads to positive attitude towards use of ICTs in extension activities.

The variables viz., gender, nativity, achievement motivation, economic motivation, management orientation, risk orientation and technology management orientation were found non-significant with attitude of the respondents towards use of ICTs in R&D, SDA and private sector.

CONCLUSION

The results of present study shows that attitude of agricultural extension personnel towards use of ICTs in agricultural extension system is very much affected by the age, education, number of years of service, possession of smart gadgets, sources of awareness about ICTs, methods of learning ICTs, trainings received, innovativeness, scientific orientation, information management orientation and orientation towards extension service profession. Attitude towards any object, idea, technology etc. develops in long run whether positively or negatively. Same is also true with the use of ICTs in agricultural extension system.

The factors like age and education are indirectly contributing towards development of positive or either negative attitude of use of ICT in agricultural extension system and it cannot be controlled as other variables/ factors but the other factors like trainings, number of years of service, possession of smart gadgets, and methods of learning ICTs etc are very much directly contributing towards it. Even for training and creating awareness about effective use of ICT in agricultural extension system to the grass root extension workers, the blended mode of ICT can be utilized. With this, not only the extension personnel get learn about the technology but also they become well aware about knowhow of the technology and in future can better utilize in their field situations as per the needs and demands.

Thus, with the help of findings of the study, it could be concluded that with the diverse and positive benefits

of ICTs in extension system, attitude of agricultural extension personnel can be molded by providing proper facilities in terms of trainings, infrastructure, budget, incentives and awareness.

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