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DEVELOPMENT OF SCALE TO MEASURE ATTITUDE OF EXTENSION PERSONNEL ABOUT INFORMATION AND COMMUNICATION TECHNOLOGY APPLICATION IN AGRICULTURE

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ABSTRACT

Majority of Indian population is still depending on agriculture for their livelihood. At the present time agriculture sector is facing the problem of slowdown growth rate. One of the reasons behind declined growth rate is failure of public extension system in transfer of agriculture technology to the farming community. Information and communication technologies (ICTs) have potential to revitalize the crumbling extension system. Therefore, the application of ICTs in agriculture extension needs to be increased. Public extension system needs to be increased the use of information and communication technologies for speed up the process of technology transfer in agriculture. Before handing over the ICT tools to the extension personnel it is necessary to know the attitude of the extension functionaries about ICT application in agriculture. Earlier there was no scale to measure the attitude of extension personnel about ICT application in agriculture therefore; an attitude scale was developed on the basis of Likert's summated rating technique. The scale was then standardized and tested for measuring the attitude of the extension personnel about ICT application in agriculture. The final scale presented here is ready for further use.

INTRODUCTION

The Indian agricultural sector has been characterized by low productivity growth despite periods of strong growth in the past. To achieve faster productivity growth serious challenges like ICT infrastructure constraints, wider ratio of farmers to extension personnel, digital divide existed among the research-extension & farmers, agriculture marketing deficiencies, shortage of finance and significant problems in the diffusion of and access to agriculture information must be addressed. To achieve a higher agricultural growth rate, ICT revolution in India must be preceded because modern ICTs have the potential to bypass several stages & sequences of development process. ICTs can accelerate the information delivery system of India. In earlier decades these ICTs have proved their potentialities in term of accuracy, cost effectiveness, speed, quality, quantity and timeliness. It is evidently proved that ICTs are very beneficial to the farming communities and have power to revolutionize agriculture extension system of the country (Verma et. al. 2012). No doubt the application of ICTs in agriculture will increase in future. Therefore, it is important to know the opinion of the extension personnel about information and communication technology application for agriculture extension. Generally opinion of a person is expressed in term of attitude. Attitude has been defined as the degree of positive or negative affect associated with some psychological objectives (Edwards, 1969). Attitude of an individual plays important role in the adoption or rejection of an innovation. The success or failure of any programme or activity to a large extent depends on the favourable attitude of its clientele towards the proposed programme. Measuring this psychological variable provide basis for desirable change in existing system. So, it was felt necessary to develop an attitude scale which can measure the attitude of extension personnel about ICT application in agriculture. For this an attempt has been made to develop a scale which can scientifically measure the attitude of respondents towards application of information and communication technology in agriculture. Earlier there was no scale available to measure extension

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personnel's attitude about ICT application in agriculture. Hence, the present study was contemplated to develop and standardize a scale for measuring extension personnel's attitude towards ICT application in agriculture. This was a part of the larger Ph.D. study on "Status and prospects of application of information and communication technologies in agriculture through extension personnel" conducted at Maharana Pratap University of Agriculture & Technology during 2009-2013 (Verma, 2013).

The main objective of the study was

to develop scale to measure attitude of extension personnel about information and communication technology application in agriculture.

RESEARCH METHODOLOGY

Attitude is an organized predisposition to think, feel, perceive and behave towards a cognitive object. Attitude in this study was operationalised as the degree of positive or negative feeling of extension personnel about the Information and Communication Technologies (ICTs) application in agriculture.

There are several techniques available for constructing attitude scale but all of them were not equally useful for the present study. While, looking into the need of present investigation and effectiveness of the available techniques of scale construction, only Likert's summated rating scale was considered most appropriate, as it requires less number of items and judges to start with. It is also relatively less time consuming as compared to other techniques. The steps for scale construction are as under.

Item collection

As a first step, for developing attitude scale, a large number of statements about application of information and communication technologies in agriculture were collected from books, bulletins, magazines and by holding discussion with subject matter specialists as well as personnel of agriculture department. A tentative list of 90 statements was prepared keeping in view the availability of statements suited to the area of study.

Editing of items

The statements so collected were carefully edited, revised and restructured in the light of informal fourteen criteria suggested by Edwards (1969). These statements were framed in such a way that they expressed the positive or negative attitude. In order to get a five point judgment five alternative response categories ranging from strongly agree to strongly disagree were assigned to each statement. The statements collected about ICT application in agriculture were further discussed with extension specialists. They were asked to add, delete or modify any statement which they deemed fit for inclusion or deletion. Again the statements were rewritten in the light of comments of the experts. After editing, total numbers of 60 statements were retained for further analysis. These statements were found to be non-ambiguous and non-factual.

Relevancy test

It was possible that some of the statements collected may not be relevant equally in measuring the attitude of extension personnel about ICT application in agriculture. Hence these statements were subjected to scrutiny by an expert panel of judges to determine the relevancy and screening for inclusion in the final scale. For this, the list of sixty statements was send to the panel of judges. Judges comprised experts of extension education, sociology and psychology from Maharana Pratap University of Agriculture & Technology, Udaipur; Mohanla Sukhadiya, University, Udaipur and Swami Keswanand Rajasthan Agriculture University, Bikaner. The statements were sent to sixty Judges with request to critically evaluate each statement for its relevancy to measure attitude of extension personnel about ICT application in agriculture. The judges were requested to give their response on a five point continuum *viz*, highly relevant, relevant, neutral, irrelevant and highly irrelevant with scores 5, 4, 3, 2 and 1 respectively. Out of 60 judges only 45 responded in a time span of one month. The relevancy score of each item was ascertained by adding the scores on rating scale for all the 45 judges' responses. From these data relevancy percentage, relevancy weightage and mean relevancy scores were calculated for all the statements by using the following formulae.

Relevancy percentage

Relevancy percentage was worked out by summing up the scores of highly relevant, relevant and neutral categories, which were converted into percentage.

Relevancy Weightage (R.W.): Relevancy weightage was obtained by the following formula.

$$RW = \frac{HRR + RR + NR + IR + HR}{MPS}$$

Mean Relevancy Score (MRS): MRS was obtained by the following formula.

$$MRS = \frac{HRR + RR + NR + IR + HR}{N}$$

HRR = Highly Relevant Response (X5)

RR = Relevant Response (X4)

NR = Neutral Response (X3)

IR = Irrelevant Response (X2)

HR = Highly Irrelevant (X1)

MPS = Maximum Possible Score (45×5 =225).

N = Number of judges (45).

Using these three criteria the statements were screened for their relevancy. Accordingly, statements having relevancy percentage >70, relevancy weightage >0.70 and mean relevancy score > 3.5 were considered for final selection of statements. By this process, 49 statements were isolated in the first stage, which were suitably modified and rewritten as per the comments of judges. These 49 statements were relevant to ICT application in agriculture.

RESULT AND DISCUSSION

Item analysis (Computation of 't' value)

Analysis of the statements is really an important step in the construction of a valid and reliable scale. For this purpose selected 49 statements were subjected to item analysis to delineate the items based on the extent to which they can differentiate the respondent with high attitude than the respondent with low attitude about ICT application in agriculture. For computation of 't' value 49 edited statements were first administered to a group of randomly selected 60 subjects from non sample area. The respondents were asked to indicate their degree of agreement or disagreement with each statement on the five-point continuum ranging from "strongly agree" to "strongly disagree". The scoring pattern adopted was 5 to 1, in which, 5 weights to strongly agree response, 4 to agree response, 3 to undecided response, 2 to disagree response and 1 to strongly disagree response for positive statement and for negative statement, the scoring pattern was reversed. Based upon the total scores, the respondents were arranged in descending order. The top 25 per cent of the respondents with their total scores were considered as the high group and the bottom 25 per cent as the low group, so as these two groups provide criterion groups in terms of evaluating the individual statements as suggested by *Edwards (1957)*. Thus out of 60 farmers to whom the items were administered for the item analysis, 15 farmers with lowest, 15 with highest scores were used as criterion groups to evaluate individual items. The critical ratio, that is the 't' value which is a measure of the extent to which a given statement differentiates between the high and low groups of the respondents for each statements was calculated by using the formula suggested by *Edward (1957)*.

$$t = \frac{\overline{X}H - \overline{X}L}{\sqrt{\frac{\Sigma(XH - \overline{X}H)^2 + \Sigma(XL - \overline{X}L)^2}{n(n-1)}}}$$

Where:

$$\Sigma(XH - \overline{X}H)^2 = \Sigma XH^2 - \frac{(\Sigma XH)^2}{n}$$

$$\Sigma(XL - \overline{X}L)^2 = \Sigma XL^2 - \frac{(\Sigma XL)^2}{n}$$

Whereas:

ΣXH^2 = Sum of the squares of the individual scores the high group.

ΣXL^2 =Sum of the squares of the individual scores the low group.

XH =Mean score on a given statement for the high group.

XL =Mean score on a given statement for the low group.

n =Number of subjects (respondents) in each group.

Table 1: Attitude statements of ICT application with their ' t ' value.

Item No.	Attitude statements	t - value
1.	ICTs are capable providing solution to all technical problems pertaining to agriculture & allied activities (+)	1.44
2.	Wider ratio of the farmers to the extension worker (1000:1) cannot be bridge up by using ICTs (-)	9.88
3.	ICT facilitate farm planning by providing early weather forecasting (+)	2.35
4.	ICTs are unable to meet the increasing demands of peasantry (-)	16.66
5.	ICTs can reduce vulnerability of the farming community (+)	6.66
6.	Effective agriculture policy cannot be formulated by inviting suggestions through ICTs (-)	10.0
7.	ICTs facilitate resource management and mitigation of environmental risks (+)	5.55
8.	Computer is not capable for solving agriculture related problems (-)	19.16
9.	Computer speedup the reporting process in the organization (+)	2.13
10.	Computer cannot be used as data storage bank (-)	4.07
11.	For most extension worker computer is a typing machine (+)	0.14
12.	Computer is not effective tool for organizing trainings to the farmers (-)	11.11
13.	Computer is a good source for offline agriculture content (+)	5.0
14.	Computer is not powerful means for capacity building of farming community (-)	20.0
15.	Computer enables extension workers to take quick decision about farming practices (+)	5.51
16.	Portable hard disk and pen drives are uncomfortable data traveling tools (-)	2.06
17.	CD-ROMs developed on agriculture technologies are useful to the farmers (+)	4.44
18.	Computer illiteracy is constraint for internet browsing (-)	1.89
19.	Internet is a means for accessing online agriculture information (+)	-0.09
20.	Internet is not a low cost ICT means (-)	0.84
21.	Internet ensures accuracy of information (+)	6.11
22.	Effective monitoring of extension activities is not possible through Internet (-)	0.58
23.	Internet enhance decision making capacity of extension workers (+)	11.76
24.	Internet cannot help in risk management for profitable farming (-)	5.16
25.	Internet is a tool for strengthening linkage between agriculture and allied departments (+)	6.53
26.	Seeking information through Internet is complex process (-)	1.35
27.	Internet is a means of passing leisure time for extension workers (+)	3.42
28.	Agricultural websites are not good source of information for field functionaries (-)	6.66
29.	AGMARKNAT is reliable website for accessing market information (+)	17.66
30.	Poor Internet connectivity in the rural areas restrict the application ICT in agriculture (-)	4.61
31.	Internet updates extension functionaries about the agriculture development programmes and activities (+)	1.03
32.	Internet cannot facilitate the extension functionaries to access global market information (-)	2.22
33.	Mobile phone reduces the social isolation among farming communities (+)	3.12
34.	When misused Internet has adverse effect on extension workers (-)	-0.95
35.	Cell phone is a tool for quick dissemination of information to the clients at the right time (+)	1.11

36.	Mobile phone cannot deliver the technological information in the local language (-)	1.66
37.	Mobile phone is a effective tool to reach the target farmers (+)	2.85
38.	Cell phone does not facilitate networking among the farming community (-)	11.25
39.	Cell phone is cheapest source for information exchange (+)	10.71
40.	The number of information kiosks are scanty in the rural areas (-)	-1.25
41.	Voice mail is effective technology to arouse interest about new agricultural technology (+)	3.84
42.	Information kiosks are not effective in satisfying the farmers need (-)	2.38
43.	Information kiosks provide professional extension services to the farmers (+)	9.52
44.	Field functionaries have very poor acquaintance in operating the information kiosks (-)	3.75
45.	Major attraction of Kishan Call Centre is toll free number (+)	0.66
46.	KCC does not provide information in local language (-)	2.35
47.	Due to busy network of KCC farmers have to wait for long time for getting the advices from KCC experts (+)	3.47
48.	Extension functionaries do not consider KCC as a credible source of information (-)	2.50
49.	Internet is high sounding futile tool for extension workers (+)	-1.48

Selection of attitude statements for scale

The 't' value is a measure of the extent to which a given statement differentiates between the high and low groups. After computing of 't' value for all the items, the statements having 't' value equal to or greater than 1.75 were selected. Thus on the basis of 't' value 13 statements (Item no. 1, 11, 19, 20, 22, 26, 31, 34, 35, 36, 40, 45, 59) were rejected and rest 36 statements were included in the final attitude scale.

Standardization of the scale

For the purpose of standardization validity and reliability of the scale was ascertained as following.

Reliability of the scale

There are various methods to determine the reliability of the scale but here test-retest method was used for this purpose. The scale was administered twice to the same group of respondents (other than the actual respondents) numbering 30 at an interval of 15 days. The agreement between the scores was obtained from the two applications of the same scale by means of a correlation coefficient (r_{tt}) which is called coefficient of dependability. The correlation coefficient (r_{tt}) calculated was 0.86 which (at 1 per cent level of significance) indicates that the scale is reliable.

Validity of the scale

To find out validity of the scale the statements were presented to a panel of subject matter specialists and personnel related to information and communication technology to find out jury validity which resulted in certain modification. In this way the scale for measuring the attitude of the respondents about ICT application in agriculture was ready for its final use.

Standardized final scale

The final scale consists of 36 statements about information and communication technology application in agriculture. The responses had to be recorded on a five point continuum representing strongly agree, agree, undecided, disagree, and strongly disagree with scores of 5, 4, 3, 2 and 1 for positive statements and vice-versa for negative statements. The attitude score of each respondent can be calculated by summing the scores obtained by him on all the items.

Table 2: Standardized scale to measure the attitude of extension personnel about ICT application in agriculture:

S. No.	Statements	Response Categories				
		SA	A	UD	DA	SDA
1.	ICT facilitate farm planning by providing early weather forecasting (+)	5	4	3	2	1
2.	Wider ratio of the farmers to the extension personnel (1000:1) cannot be bridged up by using ICTs (-)	1	2	3	4	5
3.	ICTs can reduce vulnerability of the farming community (+)	5	4	3	2	1
4.	ICTs are unable to meet the increasing demands of peasantry (-)	1	2	3	4	5
5.	ICTs facilitate resource management and mitigation of environmental risks (+)	5	4	3	2	1
6.	Effective agriculture policy cannot be formulated by inviting suggestions through ICTs (-)	1	2	3	4	5
7.	Computers speed up the reporting process in the organization (+)	5	4	3	2	1
8.	Computer is not capable for solving agriculture related problems (-)	1	2	3	4	5
9.	Computer is effective tool for organizing trainings to the farmers (+)	5	4	3	2	1
10.	Computer cannot be used as data storage bank (-)	1	2	3	4	5
11.	Computer is powerful means for capacity building of farming community (+)	5	4	3	2	1
12.	Computer is not a good source for offline agriculture content (-)	1	2	3	4	5
13.	Portable hard disk and pen drives are comfortable data traveling tools (+)	5	4	3	2	1
14.	Computer is not helpful for extension personnel to take quick decision about farming practices (-)	1	2	3	4	5
15.	Computer literacy is necessary for internet browsing (+)	5	4	3	2	1
16.	CD-ROMs developed on agriculture technologies are not useful to the farmers (-)	1	2	3	4	5
17.	Internet enhance decision making capacity of extension personnel (+)	5	4	3	2	1
18.	Internet cannot ensure accuracy of information (-)	1	2	3	4	5
19.	Internet is a tool for strengthening linkage between agriculture and allied departments (+)	5	4	3	2	1
20.	Internet cannot help in risk management for profitable farming (-)	1	2	3	4	5
21.	Internet is a means of passing leisure time for extension personnel (+)	5	4	3	2	1
22.	Agricultural websites are not good source of information for field functionaries (-)	1	2	3	4	5
23.	AGMARKNAT is reliable website for accessing market information (+)	5	4	3	2	1
24.	Poor internet connectivity in the rural areas restrict the application of ICT in agriculture (-)	1	2	3	4	5
25.	Mobile phone reduces the social isolation among farming communities (+)	5	4	3	2	1
26.	Internet cannot facilitate the extension functionaries to access global market information (-)	1	2	3	4	5

27.	Mobile phone is an effective tool to reach the target farmers (+)	5	4	3	2	1
28.	Cell phone does not facilitate networking among the farming community (-)	1	2	3	4	5
29.	Voice mail is effective technology to arouse interest about new agricultural technology (+)	5	4	3	2	1
30.	Cell phone is not expensive means for information exchange (-)	1	2	3	4	5
31.	E-mitra provide professional agriculture services to the farmers (+)	5	4	3	2	1
32.	Common service centers are not effective in satisfying the farmers need (-)	1	2	3	4	5
33.	KCC provide information in local language (+)	5	4	3	2	1
34.	Field functionaries have very poor acquaintance with operating the information kiosks (-)	1	2	3	4	5
35.	Due to busy network of KCC farmers have to wait for long time for getting the advice from KCC experts (+)	5	4	3	2	1
36.	Extension functionaries do not consider KCC as a credible source of information (-)	1	2	3	4	5

(SA= Strongly Agree, A=Agree, UD=Undecided, DA= Disagree, SDA= Strongly disagree)

CONCLUSION

Relevance test, item analysis, reliability and validity test are the important statistical tests for developing and standardizing attitude scales. Relevance test helps in selection of closely related items whereas; item analysis is to be done for selection of statistically appropriate subjects which can differentiate the respondents with positive attitude to negative attitude. Thus it can be concluded that finally selected items are highly relevant to ICT application and statistically fit for the measuring attitude about ICT application in agriculture. The reliability and validity values of the scale show the precision and consistency of the scale therefore, it can be concluded that the entire scale is highly reliable and valid for further application. This scale can be used to measure the attitude of extension personnel beyond the study area with suitable modifications.

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