Original Research Article

Development of a scale tomeasuretheattitudeofextension personneltowardsICT

ABSTRACT

Information and communication technology is readily assisting extension workers towards addressing various obstacles of agricultural extension system. Major responsibility of extension is to disseminate information, skills, and attitudes that are not readily acquired through formal education. In light of this, a standardized scale was developed using Likert's technique of scale construction also known as summated rating scale. The procedure began with dimension identification, item collection, relevancy and item analysis, reliability and validity checks to ensure accuracy and consistency of the results. A list of 80 items which intends to measure attitude towards ICT was collected for the relevancy test. One hundred judges were approached using Google forms for relevancy of statements. Finally, 19 statements made up the final scale based on the relevancy test and "t" values more than 1.75 resulting from item analysis. Cronbach's alpha value was found to be 0.70and Spearman-Brown coefficient was found to be 0.55 which depicted high reliability. Furthermore, the Spearman-Brown Prophecy formula was used to calculate the overall test reliability, which was found to be 0.55. Based on experts opinionon 19 items for content validity and coefficient values the validity and reliability measures of the scales indicated the precision and consistency. Policymakers would find it easier to make the proper decisions by using the standardized scale to practically assess the attitude of extension personnel towards ICT.

KeyWords: SummatedRatingScale,ExtensionPersonnel,Attitude,ICT

Introduction

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Agriculture is applying the concept of ICT to deliver relevant information among itsstakeholders. Agricultural extension involves transferring of information and agriculturaltechnologiesfromresearchlabstofarmers;providingadvisoryservicestofarmersbysupportingtheirdecision-making;educatingthefarmers;andempoweringthemtohelpthemrealize their goals (Dwyer and Maredia 2021). The public extension in present conditionscannot possibly fulfill qualified manpower as one extension officer served 1162 operationholding, i.e. the ratio of extension workers to operational holding is low at 1:1162 at thenational level as against recommended 1:750 which is inadequate to address the informationneeds of farmers (LakshmiandPunima,2018).ICTareregardedas cost-effectiveandsensible tools to ease delivery of information and knowledge division among stake holders ofagricultural extension system (Frempong *et al* 2006).

Extension personnel are major part ofextensionsystem andarewellpositionedtoaccess,shareorcreateknowledgeovertheweb(Omotayo, 2005). The need of the moment is the use of modern and quick communicationchannels like ICT to disseminate and create awareness about latest farm technologies amongfarmers. Smartphones have become widely used ICT devices across the globe (O'Dea,2020) and mobile phones with internet connectivity have increased from 744 million users in2020 from 930 million users by the year 2022 (Tanushree, 2022). Hence, an immediate needarises to adopt ICT by extension personnel to increase their uptake of e-learning and increase efficiency and productivity of agricultural extension services due to which it becomesa priority to understand attitude of extension personnel towards ICT.

Attitude is increasingly being recognized as an important aspect of the ones personality. It is an organized predisposition to think, feel, perceive and behave towards a cognitive object. Attitudes are individually attributed emotions, beliefs and behavioral tendenciestowards a specific abstract or concrete object (Wadkar et al 2019).Attitude is a personal disposition common toindividuals, but varying in degrees, which impels individuals to react to object, situations orprepositions in ways that can be called favourable or unfavourable (Jain, 2014). Likert'stechnique of scale construction is most popular form of attitude measurement and referred asattitude scale as they are derivation of a scaling procedure developed by Rensis Likert.Attitude

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scale developed from this technique comprised of a set of statements or items thatscale a respondent's level of agreement, favorability or other similar perception. Therefore, the present study was contemplated to develop and standardize a scale for measuring extension personnel's attitude of Punjab state towards the ICT which can contribute to inform scientific and policy discussions on ICT based extension delivery system.

Material and Methods

Likert's method of summated rating scale (1932) was used to develop the attitude scale.Attitude for the present study is operationalized as the degree of positive or negative feelingassociated with ICT use and its features. All the systematic steps were followed for the scaleconstruction i.e. Item Collection, Relevancy Test and Selection of Items, Item Analysis bycomputation of 't' values, Reliability Test and Validity Test. Possible statements concerningthepsychologicalobjectattitudewascollectedbasedonreviewofliteratureanddiscussion with experts. In total a collection of 80 items were prepared initially which were organizedandstructuredinform of an attitudeitems.Theitems werescreenedbyfollowingthefourteen (14) informal criteria suggested by Edwards (1969) for editing and restructuring thestatements. Based on the screening, 51 items which formed the universe of content wereselected. The selected items include both positive and negative statements. To know therelevancy of each item, thelist of 51 statements was sent to 100 judges who comprised of experts in agricultural extensionfromICARandscientistsfromPunjabAgriculturalUniversity.Amongthejudges60respondedbackwiththeirjudgments on a five-pointcontinuum, ranging from, highly relevant to not relevant. The judges were also asked to makenecessary modifications, addition or deletion of the statement based on their judgments. BasedontheirjudgmentrelevancyscoresweremeasuredtowardsICTusingthefollowingformulae.

a) RelevancyPercentage(RP)Itwasobtainedbyusingthefollowingformula:

$$R.P.=\frac{MR\times5+R\times4+SWR\times3+LR\times2+NR\times1}{\text{Maximumpossiblescore}}\times100$$

b) MeanRelevancyScore(MRS)Itwasworkedoutusingthefollowingformula:

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$$M.R.S. = \frac{MR \times 5 + R \times 4 + SWR \times 3 + LR \times 2 + NR \times 1}{\text{No. of judges responded}}$$

The final statements for scale were selected by calculating their 't' value for each item. It is a measure ofthe extent to which a given item differentiates between the high and thelow group. Thestatements with the t-value equal to or more than 1.75 were selected for the final attitudescale, which indicates that average response of a high and low groups differs significantly.The scores obtained by the respondents were summed up and arranged in descending order.The 25 percent of the respondents with highest total score (the high group) and 25 percent ofthe respondents with the lowest total score (the low group) were selected for the analysis tocalculate thet-value usingthefollowing formula:

$$t = \frac{XH - XL}{\sqrt{\sum (XH - XH)2 + (XL - XL)2 \ / n(n-1)}}$$

Where, X_H= the mean score on a given statement for the high group, X_L= the mean score on agiven statementfor the low group, $\sum (X_H - \bar{x}_H)^2$ = the variance of the distribution ofresponses of the high group to the statement, $\sum (X_L - \bar{x}_L)^2$ = the variance of the distributionof responses of the low group and t = the extent to which a given statement differentiatebetweenhighandthelowgroup.

Scale consistency was measured by employing Cronbach's alpha method which iscalled coefficient of reliability to identify how closely set of items are related. It wasmeasured to determine correlation among set of items in scale. Validity of scale was foundusing content validity to ascertain that the scale is a representative of all aspects of constructand to make conclusions about trustworthiness of scale and to know how accurately scale willtestwhatitintends tomeasure.

ResultsandDiscussion

An objective methodology was devised in order to select the attitude items keeping inmind

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that the selected statements should adequately represent the respective content with respect to ICT, as far as possible.Items with high t- values wereselected and care was taken to include approximately equal number of positive and negative statements which are capable of differentiating the feeling of extension personnel towards use of ICT. Thereby, 19 items were selectedfor final scale using the procedure describedindetailedunderthis section.

Itemcollection

In item collection process, an item pool of 80 statements related to the study was collected throughreview of literature as well as consultation with experts. The set of 80statements were carefully analyzed by a panel of six experts in the field of scale constructiontechniques,extensioneducationscientistsandtwoexperiencedsociologistsfromPunjabAgricu lturalUniversity. Finally after rigorous discussions with experts, a total of 51 items that are phrased specifically towards measure of construct were retained out of 80 statements. Each statement was checked on the basis of 14 criteria suggested by Edward (1957).

Relevancy testandSelectionofItems

All the statements collected may not be relevant equally in measuring the attitude of extension personnel towards ICT. Hence, relevancy test is the procedure to scrutinize the items for final inclusion in scale; in the procedure the selected items were sent to the experts who comprised of ICAR scientists, Subject matter specialists in KVKs, Agricultural Extension scientists from State Agricultural Universities, Agricultural Scientists from Directorate of Extension who had knowledge in Information Communication Technology for critical evaluation and their expert judgment on the relevancy of the statements collected. Toknow relevancy of selected 51 items, it was administered to 100 judges through individualvisits, e-mail as well as Google survey form. The responses werereceived from judges in a time span of 30 days and they were asked to check each of thestatement carefully whether relevant or not using five point continnum as highly relevant (5),relevant (4), somewhat relevant (3), irrelevant (2) to highly irrelevant (1). Judges were alsorequested to make necessary modifications and additions or deletions of words, sentences, asdesired. The results of mean

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relevancy test reveals that out of 51 items that were subjected torelevancy test, 29 items made it to the cutoff point of relevancy test. Accordingly, statementshavingrelevancypercentageofmorethan69percentandmeanrelevancyscoremorethan 3.47wereconsideredforfurtheranalysisofstatements(Table1).Hence,29attitudestatements were selected after analysis on basis of relevancy test. These statements weresuitably modifiedandwrittenasperthe commentsofthejudgeswhereverapplicable.

Table 1: Relevancy percentage (RP) and Mean relevancy score (MRS) of the statementsbasedontheresponseofthejudges

S.No.	Statements	RP	MRS
1.	IhaveinterestinusingICT*	87.33	4.36
2.	UseofICTprovidesanopportunitytoupdateknowledgeofanextensionofficer*	91.33	4.56
3.	TraditionalmethodsofextensionservicesaremorereliablethanICT based extensionservices*	79	3.95
4.	UseofICTisverytimeconsuming*	85.66	4.28
5.	Videosareveryusefulforeducatingfarmersonimprovedpractices andtechnologies*	81.33	4.06
6.	Mobileisveryusefulinconnectingwithfarmers*	79	3.95
7.	ICTinfrastructureiscostly*	75.33	3.76
8.	ICTscannot demonstratecomplex farmtechnologyineasierway	43.33	2.16
9.	Accessing agriculturalwebsitesaregoodsourceofinformationfor fieldfunctionaries*	82.66	4.13
10.	ICTsatisfybasicneedsofextensionpersonnel	58.66	2.93
11.	ICTreduce theworkloadofKVKstaffandenhance theproductivityof	75	3.75

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	scientists*		
12.	It is difficult to use ICT in field situations*	74.33	3.71
13.	ICTs reduce interpersonal relationships between farmers and extension personnel	57.33	2.86
14.	Use of statistical packages is not necessary for analysis of agricultural extension data	59.33	2.96
15.	Monotony of work can be reduced by using ICT*	84.33	4.21

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16.	ICT has potential to improve credibility of agricultural extension system	59.66	2.98
17.	Uses of ICTs enhance transfer of technology*	86	4.3
18.	I feel mentally tired while using ICT for extension work*	72.33	3.61
19.	ICT help in improving Research – Extension – Farmer – Market linkage*	76.33	3.81
20.	Most of my time is wasted in browsing of information	68.33	3.41
21.	ICT utilization hampers practicality of an extension activities	54.33	2.71
22.	Feedback is fast through ICT*	79	3.95
23.	Face to face communication is enough for extension work	48.33	2.41
24.	ICTs widens the vision of an extension officer	56.66	2.83
25.	ICT helps in reducing physical stress*	75.66	3.78
26.	ICT enhances decision making capacity of extension workers*	81	4.05
27.	The cost of demonstrations and trainings gets reduced with use of ICT	49	2.45
28.	Constant up date of content on ICT is required in local language*	76	3.8
29.	ICT creates problems to inexperienced extension personnel who lacks knowledge with online technologies	59.33	2.96
30.	ICT use can increase the working capability of and capacity of extension personnel*	84.66	4.23
31.	Wider ratio of the farmers to the extension worker (1162:1) can be bridged by using ICT*	85.33	4.26
32.	ICT is very fast way to connect with farmers*	83.66	4.18
33.	ICT use is difficult to transfer relevant information	59.66	2.98
34.	Existing ICT infrastructure is not efficient	61.33	3.06
35.	Computer literacy is necessary for internet browsing*	77.33	3.86
36.	ICT are not suitable for extension activities in rural areas due to	82.33	4.11

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	frequent power cut*		
37.	ICT motivates farmers*	76.66	3.8
38.	Level of literacy of extension functionaries determine their level of understanding of ICT applications	58.33	2.91
39.	Information of new research findings can be communicated through ICTs by research institutions*	72.66	3.63
40.	KVKs should purchase ICT tools for its frontline staff*	77.33	3.86
41.	Existing speed of internet in my institute is not fast	65	3.25
42.	Technical efficiency is not required among extension staff	59.66	2.98
43.	I received ICT training from college of study as a part of course	47	2.35
44.	KCC provide information in local language.	46.66	2.33
45.	Due to busy network of KCC farmers have to wait for long time for getting the advice from KCC experts	49.66	2.48
46.	Extension functionaries do not consider KCC as a credible source of Information	56.33	2.81
47.	Mobile is an emerging ICT tool for extension work in India*	70.66	3.53
48.	Mobile phone reduces the social isolation among farming communities *	74.33	3.53
49.	ICT use is difficult to transfer relevant information	60	3
50.	ICT is necessary for agricultural and rural development*	77.33	3.86
51.	E-literacy is necessary for ICT use by the farmers	59.66	2.98

**selectedstatementsonbasisof relevancytest*

Itemanalysisandcomputationof‘t’values

Item analysis is an important step in constructing a valid and reliable scale. Thepurpose of item analysisis todeterminehow well eachitem is discriminatingbetweenpeople having different

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attitude. For this, a pilot survey was conducted in non-sampled areaand 29items thatsatisfied the criteria for relevancy test(i.e. above relevancy mean score)was administered on 60 extension personnel. They were asked to indicate their degree ofagreement on a five pointcontinuum namely; Strongly agree, Agree, Undecided, Disagreeand Strongly disagree with scores of 5 to 1 for each positive statements and 1 to 5 for eachnegativestatementsrespectively.Forthepurposeofevaluatingthestatementstherespondents were arranged in descending/ ascending order based on their individual scores.After that, criterion group was selected, i.e. 25 per cent of the respondents having the lowscore/group and 25 per cent having the high score/group were taken. The final scale wasconstructed by computing t-values as suggested in method of summated rating scale (Likert1932). The score for their response was summed up and arranged in a descending order.

After computing "t" value for all the items, 19 statements with highest "t" value equal to or greater than 1.75 were selected. The thumb rule of rejecting items with 't' value less than 1.75 was followed as suggested by, Edward (1957). As per the thumb rule selection of items to be retained in the scale, includes the scales with highest discriminating values excluding the scales with poor discriminating ability and questionable validity. Thus, 19 statements were retained for consideration in the final scale based on the following norms:-

- The 't' value should be more than 1.75
- The statement should present a new idea (the idea not overlapping with that expressed other)
- The statement should be simply worded and brief.

The results shown in Table 2revealed t-value of the items that were able to differentiate between the high and the lowgroup.

Table2:Itemanalysisofstatementsadministeredtotheextension personnel

S.No.	Statements	t-value

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1.	IhaveinterestinusingICT	1.50
2.	UseofICTprovidesanopportunity toupdateknowledgeofanextensionofficer	1.99
3.	TraditionalmethodsofextensionservicesaremorereliablethanICTbased extensionservices	2.21
4.	UseofICTisverytimeconsuming	1.80
5.	Videosareveryusefulforeducatingfarmersonimprovedpracticesand Technologies	1.33
6.	Mobileis veryusefulinconnectingwithfarmers	1.42
7.	ICTinfrastructureiscostly	-1.68
8.	Accessing agriculturalwebsitesaregoodsourceofinformationforfield Functionaries	3.13
9.	ICT reduce the workload of KVK staff	-3.19
10.	It is difficult to use ICT in field situations	3.25
11.	Monotony of work can be reduced by using ICT	1.24
12.	Uses of ICTs enhance transfer of technology	2.05
13.	I feel mentally tired while using ICT for extension work	3.05
14.	ICT help in improving Research – Extension – Farmer – Market linkage	-1.83
15.	Feedback is fast through ICT	1.79
16.	ICT helps in reducing physical stress	2.12
17.	ICT enhances decision making capacity of extension workers	-3.94
18.	Constant up date of content on ICT is required in local language	-4.39
19.	ICT use can increase the working capability of and capacity of extension Personnel	3.57
20.	Wider ratio of the farmers to the extension worker (1162:1) can be bridged by using ICT	1.92

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21.	ICT is very fast way to connect with farmers	1.78
22.	Computer literacy is necessary for internet browsing	1.90
23.	ICT are not suitable for extension activities in rural areas due to frequent power Cut	-1.95
24.	ICT motivates farmers	1.67
25.	Information of new research findings can be communicated through ICT by research institutions	1.56
26.	KVKs should purchase ICT tools for its frontline staff	1.33
27.	Mobile is an emerging ICT tool for extension work in India	2.43
28.	Mobile phone reduces the social isolation among farming communities	1.65
29.	ICT is necessary for agricultural and rural development	1.56

Description oftheFinalAttitudeScale

Thefinalstandardizedversionof thescalewouldmeasureattitudeofextensionpersonnel towards ICT which contains 19 items consisting of both positive (13) and negativestatements (6). Those statements will be placed randomly in the scale in order to obtain mosthonest responses. All the items are framed on a five point continnum. In case of positivestatements, strongly agree, agree, neutral, disagree and strongly disagree were scored as 5, 4,3,2,1,whilereversecodingwasdonefornegativestatementsrespectively.Thescoreobtained for each statement would be summed up to arrive at the attitude score for therespondents.Thescorewillrangefrommaximumtominimumonaparticularvalue.Maximumscorewould indicateafavourableattitudeandminimumscoreindicatedanunfavourble attitude towards ICT. The respondents would be categorized as ‘less favourable’,‘moderately favourable’ and ‘highly favourable’ after getting the total attitude score based onthe rangevalues ofthe attitudescorepossible.

Table3:TheFinalAttitudescalestatementsformeasuringattitudeofextensionpersonneltowards ICT

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S.No.	FinalStatements	t-value
1.	TraditionalmethodsofextensionservicesaremorereliablethanICTbasedextension Services	2.21
2.	UseofICTisverytimeconsuming	1.80
3.	Accessingagriculturalwebsitesaregoodsourceofinformationfor fieldfunctionaries	3.13
4.	ICTreducetheworkloadofKVKstaff	-3.19
5.	ItisdifficulttouseICTinfieldsituations	3.25
6.	UsesofICTs enhance transferoftechnology	2.05
7.	Ifeel mentallytiredwhileusingICTfor extensionwork	3.05
8.	ICT help in improving Research – Extension – Farmer – Market linkage.	-1.83
9.	Feedback is fast through ICT	1.79
10.	ICT helps in reducing physical stress	2.12
11.	ICT enhances decision making capacity of extension workers	-3.94
12.	Constant up date of content on ICT is required in local language	-4.39
13.	ICT use can increase the working capability and capacity of extension personnel	3.57
14.	Wider ratio of the farmers to the extension worker (1162:1) can be bridged by using ICT	1.92
15.	ICT is very fast way to connect with farmers	1.78
16.	Computer literacy is necessary for internet browsing.	1.90
17.	ICT are not suitable for extension activities in rural areas due to frequent power cut	-1.95
18.	Mobile is an emerging ICT tool for extension work in India	2.43
19.	Use of ICT provides an opportunity to update knowledge of an extension officer	1.99

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Reliabilitytest

A scale is reliable when it accurately measures what it intends to measure whenever itis applied into practical use. According to Guilford (1954), reliability is the proportion of thetrue variance in obtained test scores. Kerlinger (1964) refers reliability as the accuracy orprecision of measuring score of an instrument. Kerlinger (1964) opined that when a test givesconsistently the same results when applied to the same sample, the test is said to be reliable.This is most crucial to attitude scale construction as it shows the strength of the attitude scale.The designed scale was tested for its reliability using Cronbach's alpha method. Cronbach'salpha is a measure of internal consistency, that is, how closely related a set of items are as agroup. It is considered to be a measure of scale reliability. The value of Cronbach's alpha wasfound to be 0.70 showing that the scale has good internal consistency and thus, the scale wasreliable.

ContentValiditytest

The validity of the scale was established through content validity *i.e.*, the representativeness or sampling adequacy of the content of a measuring instrument Chovatia*etal*(2017). The scale satisfies both these criteria as the clause of universe of statements that could be made about utilization of ICT tools in Agricultural Education formulated from the standards and also in consultation with experts. Care was taken for obtaining a fair degree of content validity. Once a final list of proposed items wasdeveloped, a panel of experts reviewed the scale to establish content validity. The 19 finalstatements were given to 20 judges for their expert guidance and the suggestions given by the experts were included in the scale and therefore the scale satisfiedcontent validity. Also intrinsic validity was found to be 0.55. The calculated "t" value being significant for all the finalized statements of the score indicated that the attitude statements of the scale have discriminating values. Hence, it seems reasonable to accept the scale as a valid measure of the perception and acceptance.

Conclusion

Development of a standardized scale is a contribution to the body of knowledge in the field of social sciences

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and behavioral science. Total 19 items were included in the final scale out of which 13were positive statements while 6 were negative statements. This scale is prepared with the aim to understand the feelings of extension personnel towards using ICT in India for extension services. Past studies suggested that most of the existing tools are designed in context to developed countries have less relevance for developing countries. Therefore, to overcome the limitations, it was decided to design a new scale to understand the viewpoint of extension personnel in present scenario. The scale was checked for itscontent validity by taking the opinion of experts during its construction process and found tobe having good internal consistency of 0.70. Like any other tool ithas certain limitations like prior standardization that need to be considered before its useoutside India. The standardized attitude scale will fill the gap in the literature related toassessment of attitude towards Information and Communication Technologies uptake amongextension personnel.Itwill alsoserve as a valuable tool forfurtherattitude studies byacademicians, extension workers and social organizations involved in promoting ICT. Hence,the psychometric analysis of the scale has indicated that this tool is reliable and valid, and canprovevaluableinassessingthe attitudeofextensionpersonneltowards ICT.

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