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Developing a standardized tool for assessing the ICT competence of the agricultural extension personnel

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Abstract
Knowledge and information is the key ingredient for driving the engine socio-economic progress of an economy in the present century. Therefore, development in 21st century is driven by the use of Information and Communication Technologies (ICTs) for collection, storage, processing, retrieval and dissemination of the agriculture information to farmers. ICTs offer means of facilitating two-way interaction in an easy, fast and reliable way between research-extension-farmer systems. In order to reap the potential benefits of ICTs in agriculture, development functionaries must be well competent in using all means of information and communications technologies for extension. Extension personnel's competence in using ICTs for agriculture and allied activities benefit's the individual, organizations and nation. Accordingly, the thrust of training for extensionists' should be aligned towards designing competency-based ICT trainings. The preliminary step for planning a competency-based ICT training programme is assessment of the training gap i.e. difference between existing and required ICT competencies of extension personnel. Studies done earlier in this context are very diverse and focus on specific ICTs, rather than whole. This paper presents a set of standardized 45 statements for measuring the ICT competence of the extension personnel. A total of 118 statements were sent to 154 experts for relevancy testing through online Google form. The data obtained was analyzed using SPSS software and MS Excel. With the use of outlier analysis, factor analysis and reliability analysis, ICT competence tool for extension personnel were finalized. The competency tool will contribute towards effective human resource development interventions for the extension personnel.

Keywords: Competence, Information and Communication Technologies, Factor analysis

INTRODUCTION

Development of an economy is determined by its resource-use efficiency. Management of resources directly influences the state of social, economic, technological and political forces of production. In context of developing economies like India, management of agriculture resources is a central concern. As due to diversity of agro-ecological settings, produces, needs, opportunities and prospects the challenges faced by agriculture-based economies are innumerable. The water-scarce rain fed areas, which accounts for 63 per cent of the cultivated land, exhibit low and also unstable yield and technology transfer gaps are much wider as compared to those in un-irrigated areas (Chatterjee and Prabhakar, 2009). Sustaining growth rate and achieving the required food grain production requirement seems to be a herculean task considering challenges like non-expanding land, depleting soil and water resources, adverse impact of climate change (Lele *et al*., 2010), rising cost of production, diminishing agriculture labor availability and reduced interest of farmers in agriculture (NSAE, 2009). The growing population, changes in demand and consumption patterns (Lele *et al*., 2010), rise in fragmented land holdings, decrease in soil fertility due to excessive use of chemical fertilizers, rising poverty, economic stagnation, worsening environmental degradation further adds severity to this issue. Thus, agricultural extension in the country needs to be strengthened, as it is the key for to reducing the yield gap in farmer fields and increasing agricultural growth (Glendenning *et al*., 2010).
Access to information and improved communica-

tion networks is a crucial requirement for sustainable agriculture development. Omotayo (2005) stated that agricultural extension to a large extent depends on exchange of latest and up-to-date agricultural information between and among farmers and a broad range of other actors. ICTs as an extension tool will enhance flow of information in the application of agricultural extension services. The term ICTs refers to a family of technologies used to process, store and disseminate information, facilitating the performance of information-related human activities, provided by, and serving both the public at-large as well as the institutional and business sectors (Salomon *et al.*, 1999). It encompasses all equipment and tools (inclusive of traditional technologies of radio, video, and television to the newer technologies of computers, hardware, firmware, etc.), as well as the methods, practices, processes, procedures, concepts, and principles that comes into play during information and communication activities (Federal Ministry of Education, Nigeria, 2010).

ICTs have a potential to go beyond the boundaries of space and time, for accessing Information, training and education, while also facilitating processing of information by the user at the same time. Molina *et al.* (2016) explicitly stated ICTs have some traits as i) storage and transmission of large volumes information; ii) dynamism and formalism to present changing information in a cohesively structured and logical way; iii) hypermedia and multimedia to represent information in various formats in a non-linear way; iv) interactivity to facilitate manipulation of information in two directions; and v) connectivity for networking and the new possibilities for group and collaborative working that provide many ways of improving quality. Coll (2004) stated that ICTs in agricultural extension and rural development have witnessed an upsurge in almost all areas of rural life in several developing countries of the world. CTA (2003) clearly mention that ICTs in context of developing economies is serving as a medium for adequate access to agricultural information, despite the persisting problems of access, connectivity, literacy, content and costs. The diffusion of ICTs in the agricultural sector provides opportunities for increasing productivity, income generation, decreasing regional disparity and improving market linkages (Ratna, 2008). ICTs can serve to equip the communities with very crucial scientific knowledge and information can greatly impact agricultural production and food security.

In most of the developing economies agricultural information is disseminated amongst farming communities by public extension workers. The plight associated with this primitive structure of information dissemination is that, being bureaucratic they lack in terms of reach, providing up-to-date and tailored information to the farmers (Bell, 2015). Furthermore, the wide farmer extension ratio i.e., 1:2879 also limits the reach and access of extension services (Mukherjee and Maity, 2015). Hence, innovative information systems are vital for addressing this gap (Munyua, 2008). The extension approach needs to be more diversified, knowledge-intensive, demand driven, effective and resource efficient. Simultaneously, the role extension functionaries should be evolved as facilitators of information, knowledge, communication, advocacy services and broader services for improving livelihoods. Introduction of ICTs in extension framework can meet these expectations really well. Extension personnel's knowledge and skills to manipulate ICTs tools is essential requirement for effective and successful extension service delivery (Lawal Adebowale, 2009; Albert, 2014).

Thus, becoming proficient in using ICTs to fulfill job functions by the extension personnel has become the need of the hour. The ICT literacy as stated by 'The Minnesota Governor's Council on Developmental Disabilities' focuses on the developing abilities in an individual in order to: i) Use technology as a tool to research, organize, evaluate, and communicate information, ii) Use digital technologies (computers, PDAs, media players, GPS, etc), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy and iii) Apply a fundamental understanding of the ethical/ legal issues surrounding the access and use of information technologies. ICT literacy further extends to the concept of ICT competence which calls for deepening of ICT related concepts gained through education and experience. Information and communication technology competence is based on sets of relevant understandings, knowledge, attitudes and skills. Kirschner and Woperies (2003) highlighted some major ICT competencies as: i) Making personal use of ICTs, ii) Mastery of a range of educational paradigms that make use of ICTs, iii) Making use of ICTs as minds tools, iv) Using ICTs as tool for teaching, v) Mastering a range of assessment paradigms which involves use of ICTs and vi) Understanding the policy dimensions of the use of ICTs for teaching and learning. Competence in using ICTs is related with tasks of information access and management, problem solving, decision making, communicating, creative expression, and empirical reasoning.

The importance of information and communication technologies for development functionaries is inevitable. Nowadays, both extension service providers and extension clients are experimenting with new digital opportunities to exchange, process, manage and communicate information for helping rural farmers effectively utilize any agricul-

tural information received (Sanusi *et al*., 2010). Individual characteristics, information needs and attitudes of extension workers on ICT have the impact on searching and acquiring information from relevant information sources and deliver them to their clientele through appropriate ICT (Koyenikan, 2011). Therefore, equally important is to understand the needs of extension personnel for systematic improvement of knowledge and skills of using ICTs. Mishra (1990) reported that training needs for extension personnel can be defined in terms of gap between job requirement and job performance. For training of extension personnel, the needs assessment should be based on needs, wants and aspirations of the extension workers themselves since they can easily identify their own plus and minus points. The national priorities, developmental programmes, farmers' felt needs for training, individual and institutional priorities also lay the foundation within the ambit of which the training priorities of extension personnel are set.

The primary objective of the study was designing and validating standardized tool for assessing the training needs of the extension personnel associated with use of ICTs for agricultural extension.

MATERIALS AND METHODS

Participants and procedure: The study was conducted in the year 2018, and the process of developing (included searching, manipulating and finalizing) set of statements, sending questionnaire, analyzing data and interpreting results took a period of about 7 to 8 months. The respondents for the survey were the people belonging to the field of extension and related activities i.e., research scholars, academicians and professionals. The sample of respondents for the survey was not restricted to any specific region of the country.

Research instrument: For collection of data, an online questionnaire was created using Google form and was sent to the above mentioned categories of respondents. The e-mail addresses of the respondents were collected from the carbon copy link of the mails forwarded to the researcher by different conference/seminar organizers. A total of 154 e-mail addresses were screened and were forwarded a copy of Google form-based questionnaire. The online questionnaire comprised of two broad sections-

Section 1 comprised of the covering letter

Section 2 consisted of the basic information of the respondent and the statements related to ICT competencies

Each of the statement was supposed to be judged by the respondents in terms of being suitable for measuring ICT-use competency of the extension personnel. A total of 118 statements were relating to ICT-use competencies were mentioned in the online questionnaire. The statements were selected on the basis of available research paper, articles, books and other literature as well as the personnel experience of the researcher. Every care was taken that competency in context of all ICTs relating to agricultural extension, either conventional or modern were included in the questionnaire. For each of the competencies, the respondents were expected to select any one option from "Not Relevant, Relevant and Very Relevant". Besides this, an option was also made available for comment (in terms of correction, clarification and improvement in the syntax of the statements) on each of the competency statements. The form sent for reminder twice within a gap of 10-15 days, to those respondents from where responses were not obtained after first e-mail and even second e-mail. Overall after a period of about two months, out of 154 only 57 respondents submitted their online responses.

Data analysis: The obtained responses were retrieved in the form of excel sheet, which is one of the in-built features of the Google form. The analysis of the obtained data was done following 5 basic steps as:

- Checking the obtained data table (corrections, left responses, comments, etc.)
- Outlier analysis using quartile method
- Feeding the data in SPSS version 20 software
- Conducting Factor Analysis
- Assessing the reliability and validity of statements and finalization of competency tool

RESULTS

Characteristics of the respondents: A perusal of Table 1 stated that most of the respondents were research scholars (61.41%), followed by teaching professionals (21.50%) and scientists (17.54%), in terms of designation held by them presently. Table 1 reveled that most of the respondents belonged from central and deemed institutions (43.86%), followed closely by belonging to SAUs (33.33%) and research institutions (22.81%). It is also clearly visible form Table 1 that majority of the respondents who submitted their responses were from agricultural sciences (66.67%) followed by allied sciences (33.33%).

Outlier analysis using quartile method: Outlier analysis is one of the most important procedures that should be used by the researcher on the data set obtained from the experiment, prior initiating with the process of data analysis. Outlier is defined as, 'an observation (or subset of observations) which appears to be inconsistent with the remainder of that set of data' (Barnett and Lewis, 1994). An outlying observations, tends to deviate from all other members of the sample remarkably (Grubbs, 1969). The occurrence of outliers in any distribu-

Table 1. Profile characteristics of the respondents.

S. N.	Designation	Frequency (N=57)
1.	Teaching professionals (Professor, Associate/Assistant Professor, Lecturer, etc.)	12 (21.05)
2.	Scientists (Directors, SMS, etc.)	10 (17.54)
3.	Research Scholars (Ph.D.Students, PDF, RA, etc.)	35 (61.41)
S. N.	**Organization**	**Frequency**
1.	State Agricultural Universities (SAUs)	19 (33.33)
2.	Central and Deemed Universities	25 (43.86)
3.	Research institutes	13 (22.81)
S. N.	**Department**	**Frequency**
1.	Agricultural sciences	38 (66.67)
2.	Allied sciences (agriculture)	19 (33.33)

N= Total number of respondents, Figure in the parenthesis indicates percentages

Table 2. Outlier analysis with use of Quartile method.

S. N.	Total Score of ICT-use competencies	Outlier	Calculated values	S. N.	Total Score of ICT-use competencies	Outlier
1.	232	FALSE		30.	234	FALSE
2.	317	FALSE		31.	328	FALSE
3.	294	FALSE		32.	240	FALSE
4.	237	FALSE		33.	216	FALSE
5.	288	FALSE		34.	261	FALSE
6.	266	FALSE		35.	274	FALSE
7.	209	FALSE		36.	242	FALSE
8.	241	FALSE		37.	327	FALSE
9.	265	FALSE		38.	303	FALSE
10.	257	FALSE		39.	309	FALSE
11.	286	FALSE		40.	280	FALSE
12.	313	FALSE		41.	305	FALSE
13.	253	FALSE	q1= 237	42.	244	FALSE
14.	261	FALSE	q3= 283	43.	212	FALSE
15.	266	FALSE	IQR= 46	44.	270	FALSE
16.	252	FALSE	Upper Bound= 352	45.	251	FALSE
17.	228	FALSE	Lower Bound= 168	46.	48	TRUE
18.	265	FALSE		47.	261	FALSE
19.	123	TRUE		48.	260	FALSE
20.	307	FALSE		49.	283	FALSE
21.	286	FALSE		50.	202	FALSE
22.	283	FALSE		51.	246	FALSE
23.	234	FALSE		52.	276	FALSE
24.	281	FALSE		53.	259	FALSE
25.	257	FALSE		54.	225	FALSE
26.	236	FALSE		55.	283	FALSE
27.	230	FALSE		56.	232	FALSE
28.	248	FALSE		57.	256	FALSE
29.	297	FALSE				

S. N. 19 and 48 were found to be outliers in the study

tion although is a matter of chance. Outliers are present in any data set either due to variability of data set, experimental error, faulty recordings, execution and measurement issues (Huang *et al.*, 2006) or due to inclusion of a population that has a heavy-tailed distribution. Outlier points can therefore indicate faulty data, erroneous procedures, or areas where a certain theory might not be valid. However, as the number of sample increases the number of outlier tends to reduce. Outliers are the most extreme observations and include the sample maximum as well as sample minimum observations. In order to analyze outliers, there are some commonly used methods like scatter diagram, histogram, box plot, quartile method, etc. In the present research study, Quartile method has been used for analysis of outlier. For applying this method firstly total score of all individuals for 118 statements was done in MS excel sheet. Then q1 (first quartile), q2 (second quartile/median/inter-quartile range) and q3 (third quartile) was calculated using the formula function. With the help of q1 and q2, the value of upper bound score {q3+(1.5*q2)} and lower bound score {q1-(1.5*q2)} was calculated. Then using the logical function equation in excel [{=OR

Table 3. Final draft of standardized tool for assessing ICT-use competencies**.**

S. N.	Variable	ICT-use competency	Correlation Value
1.	Var76	Making graphs using MS Excel	0.874
2.	Var73	Tabulation of collected data using MS Excel	0.792
3.	Var116	Sharing links of websites via whatsapp	0.777
4.	Var77	Use of MS Word for making field reports	0.768
5.	Var74	Performing simple statistical analysis of data using MS Excel	0.733
6.	Var101	Using online money transfer apps like BHIM, PayU, Paytm etc.	0.645
7.	Var113	Sending attachments using Whatsapp	0.611
8.	Var85	Sending large data using compressor software (ZIP, RAR, etc.)	0.629
9.	Var43	Creating an agricultural blog	0.881
10.	Var44	Micro-blogging of agricultural Research and Development	0.835
11.	Var42	Creation of e-newsletter	0.805
12.	Var80	Inserting front page in the word document	0.901
13.	Var81	Designing report on MS Publisher format	0.790
14.	Var72	Scanning of documents using computer scanner	0.780
15.	Var89	Use of software for cloud storage, file synchronization, personal cloud and client software (Dropbox, Google drive,	0.803
16.	Var40	Access to free software meant for specialized extension delivery	0.797
17.	Var92	Sending e-mails to one individual	0.856
18.	Var93	Sending e-mails to multiple recipients	0.783
19.	Var94	Sending e-mail with attachments of documents	0.739
20.	Var107	Video conferencing using applications of smart phone	0.633
21.	Var108	Using web cameras for video conferencing	0.614
22.	Var102	Enabling security system in the computer and mobile set by PIN/ Password/ Thumb scanning	0.828
23.	Var104	Installing internet security suite (Kespersky, Guardian, Quick Heal, etc.) for protection against web threats, malwares etc. in the computer	0.663
24.	Var60	Use of presentation making software like Prezi	0.770
25.	Var6	Subscribing/ reading online publications on agriculture	0.863
26.	Var2	Using a search engine (Google Chrome, Mozilla, Internet explorer, etc.) to locate information	0.667
227.	Var14	Downloading media (audio and video) files on agriculture from internet	0.640
28.	Var71	Making database using MS Access	0.660
29.	Var54	Describe use of computer in agriculture extension to others	0.848
30.	Var49	Identification of computer hardware and its functions	0.863
31.	Var50	Identification of computer software and its functions	0.845
32.	Var12	Handling and installing software package	0.833
33.	Var112	Creation of whatsapp group of the scientists and farmers	0.697
34.	Var58	Working with different Operating systems (Windows, Linux)	0.846
35.	Var67	Handling and displaying content using LCD projector	0.605
36.	Var4	Navigating pages on the internet	0.759
37.	Var1	Finding information in the Internet address book	0.881
38.	Var45	Designing of instructional material with a combination of handouts, power-point, videos etc.	0.831
39.	Var9	Using favourites (bookmarks) for quick viewing	0.686
40.	Var15	Listening to online radio on agricultural programme	0.826
41.	Var95	Communicating with discussion newsgroup (e.g. Google/Yahoo! Groups)	0.842
42.	Var59	Preparing powerpoint with animation/transition and other effects	0.817
43.	Var118	Designing an organizational Management Information System	0.948
44.	Var33	Burning the designed content into a CD/DVD	0.861
45.	Var3	Finding recently viewed pages	0.847

(x>upper bound, x<lower bound)}] results were obtained in the form of TRUE/FALSE. The observations for whom result was found to be true were the outliers. Outliers were those observations whose value was more than the upper bound and less than the lower bound. An analysis of Table 2, stated that amongst a total of 57 respondents, who submitted their responses only two respondents *i.e*., respondent no. 19 and 46 were found to be the outliers (Table 2).

Feed the data into the SPSS data sheet: The observations obtained from outliers were thus eliminated from the excel sheet, for applying further statistics. SPSS is one of the common statistical software packages used for simple to complex data analysis. The data in SPSS is feed by just copying the data set obtained in the excel sheet. SPSS interface has two view i) Data view where

Table 4. Reliability statistics.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.920	0.920	45

Table 5. Item-total statistics.

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Var1	98.2037	178.543	0.358	.	0.919
Var2	97.9444	178.846	0.347	.	0.919
Var3	98.3333	183.887	-0.007	.	0.923
Var4	98.2778	181.563	0.127	.	0.921
Var6	98.0556	180.997	0.157	.	0.921
Var9	98.1296	182.983	0.045	.	0.922
Var12	98.2963	179.156	0.236	.	0.921
Var14	97.9815	176.245	0.426	.	0.919
Var15	98.3333	179.585	0.212	.	0.921
Var33	98.4630	178.027	0.352	.	0.919
Var40	98.1852	174.003	0.561	.	0.917
Var42	98.1481	174.695	0.560	.	0.917
Var43	98.0741	174.183	0.596	.	0.917
Var44	98.1296	174.417	0.570	.	0.917
Var45	98.0000	173.396	0.626	.	0.917
Var49	98.3704	177.973	0.363	.	0.919
Var50	98.2778	178.808	0.350	.	0.919
Var54	98.0000	179.208	0.270	.	0.920
Var58	98.2963	176.590	0.391	.	0.919
Var59	98.1111	176.553	0.431	.	0.919
Var60	98.5741	177.910	0.376	.	0.919
Var67	98.1296	176.417	0.501	.	0.918
Var71	98.3148	176.899	0.449	.	0.918
Var72	98.2778	174.129	0.500	.	0.918
Var73	98.0000	172.755	0.634	.	0.916
Var74	97.9815	171.830	0.721	.	0.916
Var76	98.0185	171.188	0.700	.	0.916
Var77	98.0370	174.678	0.554	.	0.917
Var80	98.2407	174.526	0.465	.	0.918
Var81	98.2593	174.158	0.512	.	0.918
Var85	98.1852	175.210	0.515	.	0.918
Var89	98.1667	174.255	0.596	.	0.917
Var92	98.2037	177.788	0.299	.	0.920
Var93	97.9630	175.131	0.542	.	0.918
Var94	98.1111	172.138	0.591	.	0.917
Var95	98.1667	176.330	0.463	.	0.918
Var101	98.0556	172.921	0.559	.	0.917
Var102	98.0926	174.765	0.467	.	0.918
Var104	98.2222	174.931	0.550	.	0.917
Var107	98.0370	173.810	0.552	.	0.917
Var108	97.9630	173.508	0.647	.	0.917
Var112	98.0370	178.112	0.323	.	0.920
Var113	97.9815	174.698	0.516	.	0.918
Var116	98.1111	174.780	0.491	.	0.918
Var118	98.3704	183.483	0.021	.	0.922

data set copied as such from excel or any document ii) Variable view in this the all the details (name, type, measure, width, etc.) for each variable is feed prior copying the data in the data view.

Applying factor analysis: Factor analysis is a statistical technique, which is used to identify a relatively small number of underlying dimensions, or factors, which can be used to represent relationships among interrelated variables. It helps in the identification of underlying factors that might explain the dimensions associated with data variability (Badiru, 2002). Rummel (1990) have also argued that social scientists have been using factor analysis extensively for examining patterns of interrelationships, data reduction, instrument development, classification and description of data, data transformation, hypothesis testing, exploring relationships in new domains of interest and mapping construct space. The primary purpose of conducting factor analysis in the present study was to

reduce the number of statements meant to measure the ICT competency. Factor analysis is done by through any many like principal component analysis, unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, alpha factoring and image factoring etc. The method of principal component analysis (PCA) was applied in the obtained data. PCA looks at the total variance among the variables, so the solution generated will include as many factors as there are variables. With the use of PCA and rotation method- 'Varimax with Kaiser Normalization' in the data, the variables were clustered under 25 major clusters (the correlation value was restricted to 0.60 and above). The clustered variables were keenly observed in order to sort them in terms of being relevant in judging competencies on use of ICTs in agricultural extension. A set of 45 variables (ICT-use competency) was finalized to be included in the tool, meant to assess the ICT competence of the extension personnel (Table 3). The p-value of the final set of statements for Bartlett's Test of Sphericity was also found to be significant ($p<0.001$).

Assessing the validity and reliability of statements and finalization of competency tool: The face validity of all 118 statements was measured by asking the experts to rate the statements and most of the statements were stated as most relevant and relevant by majority of the people. The reliability of the statements was measured before and after applying the factor analysis. The finalized tool having a total of 45 statements had a Cronbach's alpha value of 0.920 (Table 4). A perusal of Table 5 also stated that the reliability of the each of the 45 statements varied was also high and the value varied from 0.916 to 0.923.

DISCUSSION

A competency tool measures the level of individual proficiency across three major dimensions which are knowledge, skill, and attitude. The knowledge dimension refers to the user's basic understanding of technology and its value and benefits, skill dimension covers ability of information access/processing, evaluation, production, management, communication and use of internet network and attitude dimension indicates social as well as ethical consideration of the benefits and consequences of ICT(UNESCO, 2008). ICT competency aspects for the extension personnel have been discussed by many researchers (Thomas and Lasinde, 2013; Gangadharan, 2015; Umar, 2015) and were used in forming a set of 118 statements. The set of 118 statements sent to the respondents for judging relevancy with specific focus on knowledge and skill dimensions. As soon as the responses were obtained from the required number of respondents was obtained, the data was subjected to outlier analysis. The proper number of respondents for enhancing the power of the test is between 10 and 20 respondents (Hair *et al*., 2010). Outlier analysis was conducted in order to rule out any possibility of error that might influence the obtained responses as empirically documented by Huang *et al.,* (2006). The obtained data set was supposed to help in developing a competency tool, therefore was subjected to PCA. After applying PCA, statements were exacted on the basis of correlation score of 0.60 and above, as this increased the possibility of including more competencies. The notion of how much value of correlation should be acceptable varies largely amongst research studies (Field, 2005; Roab *et al*., 2012, Wu *et al*., 2016). The face validity was adjudged as very relevant for most and relevant for some of the statements by the respondent. The overall reliability of the finalized tool (set of 45 statements) was very high i.e., Cronbach's alpha value was 0.920, even the individual statements had very high reliability value varying from 0.916 to 0.923. The obtained reliability estimates meet the minimal criterion value of 0.70 and above (Hair *et al*., 2010; Roab *et al*., 2012, Manna *et al*., 2016).

Conclusion

The present study made an attempt to develop 45 -statements based competency tool following a systematic procedure from data checking/ correction, outlier analysis, feeding data in SPSS, factor analysis and reliability analysis using SPSS software and MS Excel. The tool had high face validity and reliability and can serve well to measure ICT competence of the extension personnel in the field of agricultural extension. The tool will serve to provide empirical data on the ICT training gap i.e., the difference between existing and required ICT competencies of the extension personnel. Therefore, it will aid in determination of realistic ICT training needs for the extension personnel. The identified needs will aid in design and development of ICT training interventions, with specific focus on developing ICT competencies of extension personnel for the state. Its long term implication will be manifested in efforts of designing action-oriented ICT policy framework for agricultural extension of the organizations and the country as whole.

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