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## Scientific tool for measurement of ICT knowledge of extension professionals

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#### Abstract

Presently Information and Communication Technology is playing a very important role in the growth and development of agriculture sector. Transfer of technology work has been increased many times due to use of ICTs by extension professionals. But still a large number of farmers are information poor. To reach such information poor farmers, large numbers of ICT efficient extension professions are required. Presently no scientific tools are available that can measure the ICT knowledge of extension professionals. Therefore in this study a scientific tool have been developed following scientific methodology to enable the researcher to test the knowledge of the agricultural extension professionals about ICTs. This tool is valid and reliable for measuring ICT knowledge of agricultural extension professionals in future.

**Keywords:** Measurement of ICT knowledge, extension professional, scientific ICT tool, agriculture

#### Introduction

The present era is rightly termed as an “Information era”. In this ‘Age of Knowledge’ information and wide access to it is considered as wealth. People want adequate and authentic information as early as possible. In recent years, there is visible shift from the old ways to the modern ways of information delivery system. ICTs are increasingly being adopted as effective tool for reaching rural communities. Yet the benefits of the information revolution are still much debated, particularly, in case of developing countries like India.

Information and Communications Technology (ICT) is a global term that includes all technologies for the manipulation and communication of information encompassing: computers, internet, cell phones, and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them. ICTs in fact encompass any medium for recording and broadcasting information like magnetic disk, optical disk, CD/ DVD, flash memory etc. Information and Communication Technologies are defined as electronic and digital technologies for storing, processing, transferring of information and communication. They are enabling technologies that allow quicker and more efficient exchange and processing of information. These new technologies are based on the silicon chips, the laser, fiber optics and a set of varying and diversified technologies. These include a wide variety of computing hardware (PCs, servers, mainframes, networked storage), personal hardware comprising mobile phones, personal devices, MP3 players, and much more; the full gamut of application software ranges from the smallest home developed spreadsheet to the largest enterprise packages and online software services; and the hardware and software needed to operate networks for transmission of information, again range from a home network to the largest global private networks operated by major commercial enterprises and of course, the internet.

Over the last three decades, remarkable developments have taken place in information and communication technology. The ICTs like desktop and laptop computers, tablet PCs, internet enabled technologies like e-mail, e-commerce, e-learning, e-conferencing, MIS, and other online services, cell phones, smart phones, tablet phone and mobile enabled services like SMS, MMS, GPRS, Mass messaging, Interactive voice response services, multimedia devices like web camera, digital camera, handy cam, data card, blue-tooth, pen drive, CD-ROMs & DVDs, various types of call centers, information kiosks, touch screen systems, expert systems, teleconferencing, video conferencing, computer assessed services, print media, electronic media, wireless application protocol (WAP), points of presence (pops), mixed media, satellite phone, FM radio, community radio, web based GIS and remote sensing have become fairly common among people.

The relevance of ICTs for agricultural development in general and for agricultural extension in particular is extremely high for a country like India. Agricultural extensionists act as direct link between the researchers and the farmers. In order to perform their role effectively and efficiently, they must have steady access to updated agricultural information. The basic problems in attaining access to updated information are lack of awareness, knowledge and attitude of the extension personnel. Thus, there is a need to assess the knowledge of extension personnel on advanced ICT tools and its role in agriculture.

Therefore it is need of time to construct and develop such tools which can accurately measure the knowledge level of extension professionals about ICT tools and techniques. Keeping in mind the above background, Scientific Tool for Measurement of ICT Knowledge of extension professionals was developed and tested for enabling future researchers in the area of ICT application in agriculture.

### Research Methodology

Knowledge may be defined as a body of understood information possessed by an individual or by a culture. Knowledge was operationalized as extent of information known or possessed by the extension professionals on selected ICT tools. In the present study knowledge level of extension personnel on ICT refers to the level of knowledge possess by an individual on different ICT tools, their utility and applications in agriculture. For that purpose a test was developed. A test is a set of questions, each of which has a correct answer, to which the people respond (Ray and Mondal, 1999) [3]. For standardizing the selected items, the procedure suggested by Anastasi (1961) [1] and followed by Srinivas *et al.* (2014) [4] and Naveen kumar and Sendil kumar (2015) [2] was adopted.

**Steps for construction of knowledge test:** With the help of following steps the researcher has developed the entire tool.

### Item Collection

The content of knowledge test is composed of questions called items. In the entire study all the items are related to information & communication technologies. The items for the test were collected from different sources. All the statements related to knowledge of information & communication technologies were prepared with the help of relevant literature available, experts of ICT and experience of the researcher. To ensure that no important aspects have been left out, these items were again discussed with the concerned subject matter specialists and extension workers.

### Initial Selection of Items

Following criteria was taken into consideration for initial selection of item.

1. The item which was able to discriminate the well informed people from poorly informed people was selected.
2. The items which were not understandable by people and the items which can be correctly answered by all or none were not included for the knowledge test.
3. Knowledge item is the matter of fact and statement. So the items related to the fact and statements were selected.
4. Item that motivate thinking rather than simple memorization were selected.

On the basis of above criteria 83 items were initially selected out of total 90 items collected for the test.

### Administration & scoring of knowledge test items

For purpose of study, 60 agricultural extension personnel of grass root level and middle level agricultural officers were selected randomly from Bundi and Kota district of Rajasthan state. Bundi and Kota districts were selected purposively. All the 83 knowledge items were administered to randomly selected 60 agricultural extension personnel and their responses were recorded and used for calculating the difficulty index and discrimination index of each item.

### Scoring Pattern

The respondents were asked to indicate their responses to each item in the knowledge test, and the correct answers were assigned score of 1, 2, 3 & 4 and incorrect answers a score of '0'. The total knowledge score for each item was calculated by summing up the scores given by all the respondents to the item.

### Item Analysis

The item analysis yields two indices i.e. difficulty index and discrimination index which was computed by following steps.

1. The items were checked and modified before administering as per necessity.
2. The schedule was administered to the randomly selected respondent (60 respondents) for item analysis. These respondents will not be included in the sample for final study.
3. The knowledge score of the individual respondent was calculated. The number of correct answer given by the respondent out of total items was the knowledge score.
4. The knowledge score was arranged from highest to lowest order of magnitude or arranged in descending order.
5. The respondent were divided in to six groups (G1, G2, G3, G4, G5, G6) and arranged in descending order of the knowledge score.
6. For the item analysis two middle groups G3, G4 were eliminated. Only four group with high and low score were considered for computation of difficulty index and discrimination index.

### Calculation of Difficulty Index

On the basis of below given formula  $P_i$  was calculated which is shown in the following table.

$$\text{Formula: } P_i = n_i \div N_i \times 100$$

### Where

$P_i$  = Difficulty index in% of  $i^{\text{th}}$  item.

$n_i$  = Number of respondent given correct answer to the  $i^{\text{th}}$  item.

$N_i$  = Total number of respondents to whom the  $i^{\text{th}}$  item was administered.

### Calculation of Discrimination Index

On the basis of below given formula discrimination index was calculated which is depicted in the following table.

$$E^{1/3} = (S_1 + S_2) - (S_5 + S_6) \div N/3$$

**Where**

$S_1, S_2, S_5, S_6$ : Were the frequencies of correct answers in group G1, G2, G5, G6

$N$  = Total number of respondent in the sample of item analysis.

**Result and Discussion**

Initial attempt was to prepare knowledge items that were found suitable for measuring the knowledge of agricultural extension personnel on ICT tools. For assuring the content validity, thorough review of relevant literature and discussion with experts were carried out for the purpose. Accordingly, 90 knowledge items were prepared. After making necessary modifications, a total of 83 items were screened out.

**Final selection of items for test**

1. The final selection of the items was done on the basis of difficulty index & discrimination index.
2. The range of the difficulty index was 8.33 to 93.33
3. The range of the discrimination index was 0.10 to 0.92
4. These values of indices were fixed on the basis of calculated value depicted in the table.
5. On the basis of difficulty index the 03 items were deleted.
6. On the basis of discrimination index the 05 items were deleted.
7. On the basis of both indices the total 08 items were selected out of 83 and 75 items were selected for final scale. These selected items are presented in the table.

**Table 1:** Show the item of statement of difficulty and Discrimination index

S. No.	Item/Statement	Difficulty Index	Discrimination Index
1	What is computer?	91.66	0.25
2	What is PC?	70.0	0.18
3	What are the advantages of computer?	67.08	0.52
4	Name the major manufacturer companies of computer.	54.16	0.60
5	What is approximate cost of computer (PC)?	93.33	0.35
6	Name the major parts of the computer.	62.91	0.85
7	What is brain of the computer?	63.33	0.75
8	Name the important input devices of computer	42.5	0.80
9	What is the nature of printer as device?	42.33	0.35
10	Name the important hardware of the computer.	52.08	0.35
11	Name the software commonly used for computer application in agriculture.	29.16	0.90
12	What is the latest version of operating system?	13.33	0.36
13	What is the function of RAM in computer?	40.0	0.32
14	What is the function of ROM?	8.33	0.65
15	Give names of storage devices.	49.58	0.25
16	What for saveas option in computer?	23.33	0.85
17	What is the function of following shortcut keys	45.41	0.89
18	What is use of sort option in computer?	11.66	0.78
19	How do you create a new folder?	61.66	0.80
20	How will you close the files, documents and programmes?	90.33	0.22
21	Name commonly use font type for English typing.	60.0	0.92
22	What is byte?	20.0	0.88
23	What is Internet?	85.0	0.55
24	Name the important internet service providers.	72.08	0.72
25	What are the advantages of the Internet?	50.83	0.43
26	What is WWW?	35.0	0.45
27	What is high speed internet service?	43.33	0.85
28	What is Wi-Fi?	51.66	0.90
29	What is data card?	56.66	0.30
30	Name the essential devices for Internet conferencing (Audio and video).	32.50	0.80
31	State the uses of Internet.	45.41	0.65
32	What is mail ID?	61.66	0.60
33	Give major search engines for searching desired information.	43.88	0.70
34	Name the important websites for getting agriculture information.	56.33	0.78
35	What is LAN?	50.0	0.88
36	What is WAN?	16.66	0.90
37	What is mobile phone?	92.00	0.22
38	Name the important manufacturer companies of mobile phone.	83.75	0.30
39	Name the different types of cell phones.	43.75	0.45
40	What is sim card?	92.0	0.26
41	What are the basic requirements to buy a sim card?	79.16	0.15
42	What is memory card?	83.33	0.54
43	What are the advantages of mobile phone?	77.91	0.58
44	State the name of mobile phone service provider	80.83	0.65
45	Which type of mobile is useful for internet browsing?	60.0	0.70
46	What are the uses of mobile phone?	71.25	0.84
47	What is GPRS service?	43.33	0.92
48	What type of agriculture information can be accessed through cell phone?	71.11	0.91
49	What is Bluetooth service?	45.83	0.50
50	What is IFFCO Kisan Sanchar Limited (IKSL)?	58.33	0.10

51	What is 3 G service?	55.0	0.42
52	What is Kisan Call Center?	92.0	0.32
53	What is dialing number of Kisan call center?	90.00	0.15
54	What are the timings for calling Kisan call center?	55.0	0.64
55	What are the advantages of Kisan Call Center?	67.5	0.60
56	What is the language used by experts for farmer's quarry?	60.0	0.60
57	Name the mode of service to the farmers by Kisan Call Center.	31.66	0.55
58	Name the fields in which Kisan Call Center provides the information.	75.11	0.44
59	Name the location of nodal office for Kisan call center in Rajasthan.	31.66	0.70
60	Who is nodal officer of Kisan Call Center in Rajasthan?	19.66	0.80
61	What is toll free number of CFCL agro services "Hello Uttam".	15.0	0.86
62	What is toll free number of Mahindra Krishi Mitra agro- advisory services?	20.0	0.82
63	At how many levels information can be had through Kisan Call Center	42.22	0.75
64	What is information kiosk?	48.33	0.85
65	What kind of information can be obtained from information kiosks?	21.66	0.78
66	In which year Common Service Center (CSC) was started	26.66	0.86
67	Who establish the Common service centers (CSCs)?	18.0	0.90
68	What are the advantages of the information kiosk?	37.91	0.85
69	What is common structure of information kiosk?	20.0	0.75
70	Who is responsible for establishing Dairy Information Services Kiosks (DISK)?	41.66	0.90
71	Name the services provided by Dairy Information Services Kiosks (DISK).	22.91	0.88
72	What is Jan Mitra project?	21.66	0.55
73	Who initiated E-Chopal?	80.0	0.55
74	What designated name is for operator of common service center at village level?	33.33	0.91
75	How many villages are covered by one CSC?	30.0	0.90

### Reliability of the test

According to Karlinger (1967) "Reliability is the accuracy or precision of measuring instrument". Here test-retest method was used for measuring the reliability of knowledge test. The test was administered to the same group of respondents numbering 30 at an interval of 15 days. The agreement between the scores was obtained from the two applications of same scale by means of correlation coefficient ( $r_{tt}$ ), which is called coefficient of dependability. The correlation coefficient ( $r_{tt}$ ) calculated was 0.83 which was significant at 1 per cent level of significance indicating that the scale is reliable.

### Validity of the test

The validity of the test depends upon the fidelity with which it measures what it is expected to measure. To find out the validity of the test content and construct validity of the test was examined. Questions were properly selected to cover the whole universe of the content of the knowledge. The selected questions were presented to a panel of subject matter specialists of information & communication technologies to find out the jury validity. All the experts rated the test as highly valid for measuring the knowledge of respondents about information & communication technologies. Only those questions which secured 80-85 per cent occurrence of expert's opinion were included in the final knowledge test.

### Administration & scoring of knowledge test items

The selected items on the basis of indices were incorporated in the final format of the interview schedule for administration to the sample respondent. The obtained score of these respondents will reflect the knowledge level of the sample.

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