

Development of a Scale to Measure the Information Efficiency of Agricultural Expert System

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The world is witnessing a revolution in Information and Communication Technology (ICT) leading to the swift and accurate transfer of message from source to the receiver. The advances in the field of information technology has evolved a number of new modes of communication and the evolution is so rapid that it is becoming difficult to keep pace with acquiring and utilizing the new tool. Local information resource centres are gaining importance with computers carrying expert systems to help farmers to make decisions. It is known that many agricultural research institutes are involved in the development of Agricultural Expert System (AES) to satisfy the information needs of farmers. Here after agricultural expert system is referred as AES as used Lipings (2003). The dissemination of the technologies could be enhanced by using expert systems and other artificial intelligence technologies (Hadi et al, 2006).

In this context Kerala Agricultural University developed an Agriculture Extension System (AES) for diagnosing pest and diseases of nine major crops of Kerala called "DIAGNOS-4".the modified version of it is likely to be released shortly for the benefit of all the stakeholders involved in agriculture development. User friendliness of the system needs special attention, which is mostly forgotten area in any technology development process. Before releasing the software it is appropriate to access the information efficiency of the AES so as to make suitable modifications for making it more user friendly.

METHODOLOGY

"Diagnos-4".is the Agricultural Expert System specially designed software for tackling the problems in transfer of technologies related to plant protection aspects of important crops of Kerala. The research was conducted among the researchers from the agricultural research institutes all over India, which are involved in developing AES and the Transfer of Technology (TOT). Forty researchers and forty extension personnel formed the sample of the study. The respondents were selected purposively who were either having an exposure or awareness about the performance of Agricultural Expert System.

The main aim behind the scale development was to construct a scale of general nature so as to enlarge the scope of application of the scale to measure the information efficiency of computer aided instruction tools. A review on various aspects of measurement of communication efficiency, inter personal communication, behavioural efficiency and managerial efficiency was attempted so as to provide a justifiable footing to the measurement procedure of information efficiency adopted' for this study. The information efficiency index was calculated, reflecting the ability of the system to provide maximum information to the users at ease.

The present study tried to assess the AES by the users such as researchers, extension personnel and farmers in terms of its information efficiency. With an elaborate review of pertinent literature available,

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consultation with experts and researcher's own conviction, sixteen dimensions were identified, which were further

reduced to ten according to judges' opinion. From the ten dimensions, five dimensions were selected based on the

Table 1. Relevancy indices of identified dimensions for measuring the information efficiency of the performance Of AES

SI. No.	Identified dimensions	Relevancy Indices			Mean	Rank
		Researchers	Extension personnel	Farmers		
1.	Proficiency of users	59.47	60.97	62.74	61.06	XVI
2	Information needs of users	62.54	63.66	65.33	63.84	XV
*3	Information content	83.65	83.34	83.31	83.43	IV
4	Information treatment	76.32	75.55	77.15	76.34	IX
5	Precision of information	65.86	66.00	64.81	65.56	IVX
•*6	Relevancy	83.88	83.52	84.85	84.08	III
7	Mode of presentation	78.05	84.51	77.26	79.94	VII
8	Serviceability	80.99	79.03	69.87	76.63	VIII
9	Settings in the system	81.24	83.01	82.17	82.14	VI
*10	Practicability	80.36	79.5	87.64	82.50	V
* 11	Retrievability	94.45	90.32	88.62	91.13	II
*12	Knowledge gain from AES	93.00	95.6	92.71	93.77	I
13	Risk in utilizing information from AES	68.17	68.32	68.69	68.39	XII
14	Dependence on AES alone	68.54	67.49	67.45	67.83	XIII
15	Provision for updating information	73.32	68.33	68.58	70.08	XI
16	Future prospects	77.14	73.14	71.89	74.06	X

*- Selected dimensions for assessing the information efficiency of AES.

stages of application and ranking of the mean relevancy indices. (Table 1).

Item generation

The items related to information efficiency of AES under each dimension were identified. The primary sources for item collection were literature and discussion with experts in related fields through critical incident technique. The collected items were screened by verifying its applicability in relation to the information efficiency of AES. Forty seven items were generated and theoretically classified under five major dimensions. The appropriateness of the items was pre-tested with a group of judges.

Preliminary screening of items

The relevancy of the forty seven items generated was established by sending these items to 50 judges with proper guidelines. The judges were asked to indicate the

relevancy of items on a five-point continuum of 'M OR- Most relevant, 'MR-More relevant', R- Relevant, 'LR- Least Relevant' and 'NR- Not Relevant'. The responses of forty judges were taken into account. The relevancy index for all the items were worked out and presented in Table 2. The items having relevancy index of 70 and above were selected for the study.

Item analysis

Item analysis was referred to a set of procedures that was applied to know the indices of truthfulness of items (Singh, 1986). Item difficulty, discrimination index and correlation of items scores with total score were the most common indices used in item analysis (Guilford, 1971).

As followed by Mathew (1989) for managerial leadership scale and Anantharaman (1991) for managerial efficiency scale, item discrimination for each of the items

Table 2. Relevancy indices of identified items for measuring the perception of the respondents regarding the Information Efficiency of AES

SI. No.	Identified dimensions	Relevancy Indices		
		Researchers	Extension personnel	Farmers
I	Information content			
1.	Relevancy of the subject matter	66.58	69.25	59.98
2	Clarity in tutorial page	67.52	66.35	60.54
3	Design of the message	69.21	68.87	67.68
4	Systematically classified information	90.11 *	66.25	69.34
5	Supports easy learning	89.54*	78.62*	64.74*
6	Complete information for decision making	88.24*	92.58*	68.39*
7	Clarity in the messages given in the entire module	92.01 *	68.38	92.14*
8	Getting systematic links	66.54	69.51	66.58
9	Easy availability of information	69.58	67.26	65.05
10	Practical feasibility of information	68.32	65.45	62.15
11	Message considers users' resources	91.94*	97.57*	94.54*
12	Ability to comprehend	66.68	69.41	68.17
13	Customized information	68.10	69.49	63.84
14	User friendliness	66.87	68.63	69.09
15	Suitability of the content	67.52	69.06	68.50
16	Acceptable by the users	98.38*	98.86*	89.46*
17	Provides explicit information	62.50	65.51	54.63
18	Provides reasons for the given solution	96.66*	97.49*	95.75*
19	Easier information search .	76.11 *	64.15	63.43
20	Sufficient and accurate information	98.69*	67.18	66.67
21	contentco~	67.92	68.68	68.96
II	Relevancy			
1	Relevance of information about the plant protection measures.	77.34*	75.62*	76.43*
2	The system is able to provide information suitable to the users' resources	84.69*	85.40*	63.90
3	Information provided in the system is appropriate to the users needs.	67.06	77.47*	67.79
III	Practibility			
1.	Practibility of information about the plant protection measure	81.15*	78.46*	79.52*
2	Information provided in the system is adoptable in the real situation.	83.33*	82.35*	65.15*
3	Information provided in the system is feasible	78.49*	76.28*	64.98

IV Retrievability				
1.	The information provided in the system can be easily located by any user	77.24*	74.38*	82.94*
2	The need based information can be received by the user with in less time.	83.27*	74.89*	78.32*
3	The received information is easily understandable by the user	75.06*	78.44*	64.39
4	The necessary information can be taken as print out for further reference.	74.34*	77.63*	68.25*
5	A common man can easily retrieve the information	72.50*	64.63	67.41*

worked with the responses of 30 extension personnel randomly selected for non-sample area, The responses were quantified by allotting scores of 5, 4, 3, 2 and 1 for the responses such as 'MOR-Most relevant', 'MR-More relevant', R- Relevant, 'LR- Least Relevant' and 'NR- Not Relevant' respectively.

RESULTS AND DISCUSSION

Selection of items for final scale

Based on the stages of application and ranking of the mean relevancy indices, the dimensions such as retrievability, relevancy, practicability, information content and knowledge gain by the respondents were selected for developing the information efficiency scale.

Retrievability: Retrievability was operationalized as finding out the required information without much effort. It was the extent to which the information was easily drawn from the system. It also indicated that the information provided in the system could be easily located by any user within less time, The received information should be easily understood by the user and could, be printed as handout for future reference.

Relevancy: Relevancy of the information was meant as the relation of something to the matter at hand, In this study it was operationalized as the opinion of the respondents about the suitability of the information provided in AES to the users' situation. It was assessed whether the system was able to provide information

suitable to the users' resources and appropriate to the users' needs.

Practicability: Practicability of the information was referred as the opinion of the respondent about the feasibility of the information given in AES in the actual field situation. The information given in AES should have direct application in the fields. Practicability was analysed as the viability and possibility of application of the information provided in AES to the users' circumstances,

The dimension of practicability was measured whether the information provided in the system was adoptable in the real situation and feasible to the users.

Information content: Information content was measured as the extent to which the information on the subject matter was covered in the system. It was assessed whether the provided information was complete and understandable to the users.

Knowledge gain: Knowledge gain was the quantity of information gained by the respondent before and after exposure of AES. Knowledge was the treasure of truth and facts and was a pre- requisite for performing any activity with perfection. It was an inevitable pre-requisite input for efficient management.

Knowledge test: To assess the knowledge gain among the respondents from AES, the respondents were subjected to 15 items twice on plant protection aspects of rice, coconut and banana as pre-exposure and post-exposure sessions