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Deciphering drivers of using ICT among academia of agricultural sciences

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ABSTRACT

Across the globe, investment in ICT to improve teaching and learning in educational institutions have been initiated by Governments. Despite all these investments on ICT infrastructure, equipment and professional development to improve education in many countries, ICT adoption and integration in teaching and learning have so far been limited. This paper investigates the factors influencing the usage of ICT tools among academia of agricultural sciences in north eastern hill states of India which is landlocked and poorly connected with the outside world. ICT can play a crucial role in overcoming its geographical exclusion and help in developing its human resource globally competitive. Slow internet speed and poor ICT infrastructure were reported as principal factors that severely affect the usage of ICT tools among the academia of agricultural sciences in north eastern hill states of India. Level of competency of teachers on ICT is also identified as a barrier. A few key measures to overcome these impediments and for facilitating greater usage of ICT in education are suggested. The findings of this study would be of practical importance to the academic administrators and civil society organizations whose aim is to provide quality higher education by integrating cost-effective capabilities of ICT in teaching and learning.

Key words: Digital technology, Educational policy, ICT, Northeast India, Technology integration

The educational technology domain has been strengthened by innovative technological developments in society overtime (Murphy and Rodríguez-Manzanares 2014). As a consequence, Information and Communication Technologies (ICTs) have substantial influence on wide range of education processes like access, equity, management, efficiency, pedagogy and satisfactions (Mondal and Mete 2012). In an increasing interconnected world, quality education necessitates maximizing the benefits of ICT and developing the corresponding partnerships in education system. This calls for reorienting the educational system for addressing the technological challenges of this millennium.

Over the couple of decades, there has been an ongoing push in India led by the Ministry of Human Resource Development, Government of India and the Indian Council of Agricultural Research (ICAR) to integrate ICT in higher learning institutions. Despite the positive results obtained in varying degree, there is still a lack of evidence that ICT has actually enhanced educational standards (Nivala 2009, Ottestad 2010, Teknik delegationen 2010). The slow progress in use of ICT may be due to lack of technology and software in schools and the limited expertise of teachers regarding ICT use to other factors such as teachers' beliefs and knowledge about how to integrate ICT into teaching environment (Hsu and Sharma 2008, Nivala 2009, Teo *et al.* 2008). The success of implementation of ICT is not merely dependent on the availability or absence of one individual factor, but is determined through a dynamic process involving a set of interrelated factors (Afshari *et al.* 2009). Indian National Agricultural Research and Education System (NARES) is one of the largest agricultural research and education system in the world and therefore, there is a need to digitally access vast amount of information available. The pertinent issues are whether the educational services providers are able to cope with the innovations? What is the situation for using ICT tools? What are the factors affecting ICT tools in education including higher education? To comprehend such issues, in the present study, an attempt was made to identify the factors that influence the use of ICT in higher agricultural education both from students as well as teachers point of view.

MATERIALS AND METHODS

The experiment was conducted during 2016–17 in six North-Eastern Hill States i.e. one college each from Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim and two colleges from Tripura State. Based on thorough literature review, the framework of Sherry and Gibson (2002) was adopted which suggests how quality of education can be improved by ICT by using various technological, individual

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and institutional factors by teachers. Two sets of structured questionnaires were developed for teachers and students. The respondents also had the opportunity to add responses in their own words in a number of open-ended questions after each of the sequences of questions in the questionnaire. The reason for this approach was to ensure that no relevant response was missed while conducting survey. Factors for the adoption and usage of ICTs within education system were identified based on the literature review. The survey questionnaire was elaborated and a five-point Likert scale was used. Based on the availability of the respondents, 120 teachers and 343 students from 7 colleges of North- Eastern Hill region had taken part in the survey.

RESULTS AND DISCUSSION

Results of the study are presented and discussed under the broad headings as students' perception on factors influencing the adoption of ICT, students' suggestions for effective usage of ICT in education, teachers' perception on factors influencing the adoption of ICT and suggestions for effective usage of ICT in agriculture education.

Profile of the student respondents: Socio-personal characters of students like age, gender, family background, and educational qualification and ICT skills are likely to influence students' attitude towards the use of ICT in learning. Therefore, these parameters were included in the research study and it was found that majority (78%) of the respondents were in the age group of 20–24 years, about one-fifth (19%) of the respondents were in the age group of above 24 years and negligible proportions (3%) were below 20 years. The study sample represented equally male and female respondents. Of the students, 58.31% of the students were from rural family background and the remaining 41.69% were from urban background. Regarding educational qualification, majority (70.55%) of the students was under-graduates and the remaining (29.45%) were postgraduates. Castro (2018) has observed differences in level of ICT use between students hailing from rural and urban area. Various academia of the opinion that networking through social media offers greater scope to students to improve their personal learning and to explore wide range of resources relevant to the area in which they are working. Further, the extent of access to social media sites found to influence most of their popular social behaviours (Kemp 2017).

Students' perception on factors influencing the adoption of ICT: It was observed that slow internet speed is affecting usage of ICT in a big way specifically for downloading and uploading educational contents (Table 1). This was followed by poor ICT infrastructure at the institutions (Ranked II) mainly the core ICT infrastructure, viz. computer laboratory having adequate number of computers with high speed internet network access points including Local Area Networks (LAN)**,** sophisticated peripherals and software, classrooms equipped with state of the art audio-visual digital facilities to support an ICT enabled teaching-learning eco-system inclusive of other pro-ICT endowments like uninterrupted and stabilized electricity supply, appropriate electrical fixtures, adequate instantaneous power backup including alternate sources of energy and other physical facilities like spacious rooms and ergonometrically designed furniture. Students indicated many lacuna in the case of access to quality ICT tools, availability of e-resources, and operational knowledge of ICT tools, competency, and initial time requirement for updating ICT skill and organizational support/policy as hindering factors in influencing adoption of ICT.

Indeed, in North eastern states, nearly about one-third (35%) of the population have access to Internet (Anonymus 2018). Such poor access to internet is further compounded by the fact that four of the five states and union territories having slow internet speed falls in Northeast India. For instance, as per the internet statistics available in February, 2018, Mizoram is the slowest with a mean download speed of 3.62 Mbps which means the internet speed is approximately 82.5% slower than the rest of the country. Manipur takes second-to-last place at 4.30 Mbps and Tripura barely edges into third-to-last place at 4.52 Mbps (Maketta 2018). This implies existence of inadequate infrastructure

Table 1 Factors intensity distribution in adoption of ICT as perceived by the students (n=343)

Factor	Level of agreement					Mean	Rank
	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)		
Initial time requirement	2.91	4.37	31.78	46.65	14.28	3.65	VII
Infrastructure facilities	2.33	5.83	17.20	42.86	31.78	3.96	II
Training on ICT tools	2.62	7.29	22.74	44.02	23.32	3.78	VI
Operational knowledge on ICT tools	2.91	4.66	20.69	49.85	21.86	3.83	V
Access to quality ICT tools	1.17	6.41	19.53	49.27	23.61	3.88	III
Internet speed	2.91	6.99	17.20	33.82	39.07	3.99	I
Availability of e-resources/SIS	1.75	6.41	22.45	42.27	(27.11	3.87	IV
Workload	3.21	7.29	40.82	37.61	11.08	3.46	IX
Organizational support and policy	3.79	5.25	36.17	41.11	13.70	3.56	VIII

for internet connectivity and also existence of few internet service providers.

Students' suggestions for effective usage of ICT in education: A list of suggestions for better usage of ICT in the educational system has been proposed by the students. Sixty-six percent of the respondents suggested developing awareness on the effective usage of ICT. Other suggestions include improved infrastructure facilities that aid in better usage of ICT in education (60%), high speed Wi-Fi connectivity to all the students (53%) and ICT orientation programmes for students, teachers and faculties (50%). Authorities at the institutes of higher agricultural education need to strive to create awareness and provide infrastructure facilities as priority measures for improving ICT usage among the students.

Personal characteristics of respondent teachers: The extent of usage of ICT in the classroom environment by teachers is influenced by their socio-personal characteristics (Gil-Flores *et al.* 2017). Therefore, it is appropriate to have an understanding of personal characteristics that influence teachers' adoption and integration of ICT into teaching.

It was observed that majority of the teachers (69.17%) are of middle age between 33-51 years. As far as the gender composition is concerned, men teachers constitute the majority (82.50%). Most of the teachers (57.50%) are from rural background and 85.83% have their highest qualification as PhD. The service experience of the teachers reveals that 70.83% of them have 3–23 years of teaching experience whereas only 23.33% teachers have received training on ICT. A recent study by Ziemba (2016) revealed that factors like gender, education, and place of residence do not influence significantly the usage of ICT in teaching-learning environment. However, factor like age significantly influence the usage of ICT. In other words, among adults, the younger ones were found to respond positively to the information seeking demands in the digital environment whereas their elder counterparts are facing difficulties in seeking information in changing digital-based environments (Yusuf *et al.* 2016). In similar lines, according to other studies, gender-based differences were observed with regard to perceived importance or value placed on technology by men and women. A recent study by Aramide *et al.* (2015) revealed that demographic factors like educational qualification, experience in using ICT, and experience in teaching were able to better predict the use of ICT by science teachers.

Teachers' perception on factors influencing the usage of ICT: In general, the responsibility of innovative use of ICT in education has mainly been placed on teachers and therefore it is considered that the teachers' behaviours are considered as pivotal to adoption of ICT. However, it is to be understood that the teachers are part of various organisations having complex functions with inherent obstacles related to their cultural and historical conditions (Castro 2018). In this regard, the present study explores the underlying institutional factors affecting teachers' adoption and institutional integration of technology, based on their own perception.

The results reveal that internet speed (Ranked I) and infrastructural facilities (Ranked II) were the most influential factors for adoption of ICT as indicated by majority of the teachers. These twin factors were also perceived by the students with same intensity (Table 1) that deter optimal usage of ICT. Thus, use of ICT in education is directly dependent on the availability of necessary ICT infrastructure which include number of computers, electricity grid and internet connectivity. Further, training on ICT (III), availability of budget (IV) and an operational knowledge on ICT tools (V) were important factors that are influencing ICT usage. Other factors like availability of e-resources, access

Table 2 Factors intensity distribution in adoption of ICT as perceived by the teachers (n=120)

Factor	Level of agreement					Mean	Rank
	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)		
Initial time requirement for ICT skill updating	1.67	5.00	28.33	45.83	19.17	3.76	VIII
Infrastructure facilities	1.67	1.67	9.17	40.83	46.67	4.29	II
Training on ICT tools	0.83	3.33	12.50	47.50	35.83	4.14	III
Age	11.67	16.67	29.17	27.50	15.00	3.18	XI
Operational knowledge on ICT tools	0.83	1.67	22.50	49.17	25.83	3.98	V
Access to quality ICT tools	0.83	5.83	20.00	43.33	30.00	3.96	VII
Internet speed	3.33	3.33	8.33	25.83	59.17	4.34	I
Availability of e-resources/SIS	2.50	3.33	20.00	43.33	30.83	3.97	VI
Workload	2.50	10.00	28.33	39.17	20.00	3.64	IX
Organizational support and policy	4.17	2.50	18.33	43.33	31.67	3.96	VII
Fund availability/ budget	3.33	2.50	20.83	38.33	35.00	3.99	IV
Incentives	5.83	10.00	35.83	31.67	16.67	3.43	X

to quality ICT tools and organizational support and policy, initial time requirement for updating ICT skill, workload with faculty, incentives and age of teachers were reported as factors in descending order of agreement in the context of enhancing ICT usage.

Teachers' suggestions for integration of ICT in education: The present study observed that majority (81.67%) of the teachers suggested capacity building programmes for faculties on the use of ICT in education with adequate practical hands-on sessions (Table 2). Sixty-one per cent of the respondents sought organizational support and provision of ICT tools. Provision of advanced and latest ICT tools and faster internet connection were suggested by 56.67% and 50.83% of the teachers respectively. Forty-eight per cent of the teachers suggested that online academic facilities should be developed at the institutions of higher learning. Indeed, procurement of ICT infrastructure like computers and other related resources are not only sufficient conditions which can enable the greater use of ICT resources by teachers but need-based capacity building coupled with ensuring adequate access to ICT infrastructure is crucial according to the study by Aramide (2015).

Empirical evidences-based understanding on the factors influencing the use of ICT in education system is crucial. In this context, the results of the current study throw insights on factors affecting the adoption and usage of ICTs within education system and also confirm the study results with some of the findings of prior studies concerning ICT in education system. One of the key factors include teachers' perception towards necessary ICT skills for its usage. The other factors include availability and access to the ICTs, their ability to meet teachers' needs, cultural practices in teachers' work environments and the capacity of the teacher to make use of various technologies as defined by the level of skills. The results of this study indicate that a majority of teachers need capacity building programme as they possess low level of knowledge and skill in applying ICT. Further, the study results reveals that organising workshop/training aiming at enhancing the academia's acquaintance with ICT will improve the usage of these technologies. This paper recommends that higher learning intuition of agricultural sciences as well as all other training institutions in North-Eastern hill states of India need to embark on tasks to integrate ICT in their institutions for teaching and learning. While doing so, the drivers identified in this study need to be taken into account for successful implementation.

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