Orientation and utility of Information and Communication Technology (ICT) Tools by Agricultural Students and Research Scholars

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Abstract

Information and Communication Technology in Agriculture (ICT-A) is an emerging field which combines the advances in agricultural informatics, agricultural development and entrepreneurship to provide better agricultural services, enhanced technology dissemination, and information delivery through various tools such as computer based advisory services (off-line), net based approaches (on-line) and mobile based services. Tamil Nadu Agricultural University (TNAU) is pioneering in the introduction of e-mode of education and teaching-learning process. In view of the ICT initiatives of TNAU, a research study was taken up involving UG, PG and Ph.D Scholars to understand the level of ICT usage by students and their attitude toward library resources. The results indicate that there is much variation among the scholars on usage of internet facilities, system utility, usage of the computer centre, library resources and on-line examination. Students also expressed the constraints and gave suggestions for effective use of ICT interventions initiated by TNAU.

Prelude

Information and Communication Technology gains immense importance when it comes to education and research. Many of the educational and research institutions have adopted the components of ICT to facilitate the scholars with access to the maximum resources for both curriculum and research requirements.

Information and Communication Technology (ICT) - or technologies is an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. It is a range of technologies for gathering, storing, retrieving, processing, analyzing and transmitting information (Wikipedia).

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Since 1950 most of the policies have consistently favoured the use of ICT in education. It is quoted that "ICT in education can be, an alternative to instructional delivery system, such as radio, educational TV and audio visual communication. Computers and computer based system for instructional delivery and management, such as CAI (Computer Assisted Instruction), use of multimedia and internet / web based education has facilitated learning" (Rai, 2007).

The major ICT initiatives at graduate level education which has its direct impact on Agriculture and Rural Development started with the 'Digital library and information network (2007) project initiated based on the recommendations of many universities in India, (Times News Network, April, 2007). (Swaminathan, 2005).

These initiatives were made possible only after the launch of EDUSAT (Iype, 2005) in 2004. India's first dedicated educational satellite. Education and ICT were blended in all combinations for developing an effective ICT based learning module.

Initiatives in promotion of ICT in Tamil Nadu Agricultural University

Among the 63 State Agricultural Universities in India, Tamil Nadu Agricultural University (TNAU) ranks fourth in the country in Agricultural Education (Times of India, 2008). TNAU's efforts in bringing out an effective teaching learning process for Agricultural Education is inevitably significant to the Agricultural and Rural Development of the country. TNAU has introduced various ICT based activities to enhance and enrich the UG, PG and PhD educational cum research programmes.

The following are the ways in which the University provides the state of art of facilities using ICT tools and its components,

- Equipping all classrooms with LCD projectors, computers, document cameras and other accessories
- Provision of computer centers with adequate computers and internet
- Establishing a modern / digital library in the existing libraries
- Enabling scholars to buy their own laptops / personal computers
- Provision of WiFi enabled internet facility on campus to enable connectivity and use of the internet
- Developing online course materials and their distribution (the soft copies of study materials in various formats can be uploaded/downloaded/retrieved whenever needed)
- Training the teaching faculty and scholars to use ICT effectively
- Pioneer in introducing Online Examinations for the scholars

In line with the ICT enabled services extended to students, TNAU has established an exclusive e-Extension centre, wherein the scientists have developed TNAU-AGRITECH Portal through which numerous on line services are being provided to the farming community of Tamil Nadu. Not only technical information about the crops and animal husbandry but the weather forecast, market forecast information can also be retrieved from the portal. The impact is visible in that the students and scientists are increasingly referring to the portal rather than the crop production guide to give technical advice to the farmers.

Need for the Study

The importance and the impact of ICT in Agricultural Education has to be studied in order to evaluate the exposure and usage of ICT components by the teachers, researchers and students which will help to correct errors, develop improved e-learning modules and bring out a desirable change in the computer and internet usage behavior of the clientele group. Hence, a behavioral research study was designed with the following objectives.

Objectives of the Study

1. To study the usage behavior of ICT and its components by TNAU scholars
2. To study the attitude of UG students and research scholars towards ICT Tools, Libraries and Online Examinations
3. To identify the constraints faced by UG students and research scholars in using ICT and its components and provide suggestions to overcome them.

Research Methodology

The study was conducted during 2009-2010 among the Undergraduate students and post graduate scholars of Tamil Nadu Agricultural University situated in Coimbatore in Tamil Nadu state. TNAU has been purposively selected for its pioneering role in ICT enabled education and extension which has been detailed in the foregoing pages .The study involved three categories of TNAU students, viz. Undergraduate (UG), Post-Graduate (PG) and Doctoral (PhD) Scholars. The total number of students to be selected was fixed as 90 which comprises of 40, 30 and 20 respondents from UG, PG and PhD respectively (Table 1). The rationale of the number of students to be selected from each category is the apriori assumption of the researcher that the total number in each category would be in descending order from UG, PG and PhD respectively and hence more the number of students the more should be their chance of getting included in the study. The

students were selected through Proportionate Random Sampling (Dhamu, 2008) procedure for which the formula is given below

$$ni = \frac{Ni}{N} X\ n$$

Where ni is number of students to be selected from ith category

Ni is the Number of students in ith category

N is the total number of students in all sub categories of ith category

n is the sample size for the ith category already fixed

Table 1. Selection of Study Sample

UG (190 Scholars)		PG (110 Scholars)		PhD (75 Scholars)	
Year (2009-10)	Sample size	Year (2009-10)	Sample size	Year (2009-10)	Sample size
II	14	I	30	I	7
III	13			II	7
IV	13			III	6
Total (n)	**40**		**30**		**20**

Data collection was done through a well structured, scalable and pre-tested questionnaire. Analysis of Variance (ANOVA), Garrette ranking and Percentage Analysis were the statistical tools used to analyze the data.

Findings and Discussion

Since the respondents are categorized as U.G, P.G and PhD scholars, the results can also be discussed with respect to their categories and on overall basis.

Table 2. Personal Profile of Respondents **(n=90)**

Contents		UG	Percent	PG	Percent	PhD	Percent	Total Percent
Domicile Background	Rural	13	33.00	18	60.00	10	50.00	**46.00**
	Semi-Urban	7	18.00	5	17.00	3	15.00	16.00
	Urban	18	49.00	7	23.00	7	35.00	38.00
Educational Background	State Board	27	68.00	22	73.00	13	65.00	**69.00**
	Matriculation	10	25.00	7	23.00	7	35.00	27.00
	CBSE	3	7.00	1	4.00	-	-	4.00
	Anglo-Indian	-	-	-	-	-	-	-
Courses on Computers	One	20	50.00	19	63.00	19	95.00	**64.00**
	Two	9	23.00	3	10.00	1	5.00	15.00
	>Two	1	3.00	1	3.00	-	-	2.00

The study profile (table 2) clearly indicates that nearly 46 percent of the sample is from a rural background who underwent school education in their state board syllabi with Tamil as the medium of instruction. Further, they have not undergone any computer course or related exposure during their school education. Hence, it is very interesting to study the impact of ICT and its components on these students in order to analyze the utility of ICT for Agriculture and Rural development.

Utility Pattern of ICT Tools/Computer

The TNAU scholars' computer/ICT accessories usage pattern was measured and details are provided in Table 3.

Table 3. Utility pattern of ICT Tools/Computer

Contents		UG	Percent	PG	Percent	PhD	Total Percent	ANOVAF Value
Proficiency in Platforms	Windows	32	80.00	26	87.00	18	**84.00**	0.179^{ns}
	Linux	3	8.00	3	10.00	1	8.00	
	Both	5	12.00	-	-	1	8.00	
Applications (Ms Office, Photoshop, CorelDraw, Dream weaver, Adobe Flash)	One	22	55.00	22	73.00	15	**65.00**	0.445^{ns}
	Two	10	25.00	5	17.00	5	22.00	
	>Two	8	20.00	3	10.00	-	13.00	
Programming languages Known	One	18	45.00	12	40.00	19	**54.00**	0.813^{ns}
	Two	10	25.00	6	20.00	1	19.00	
	>Two	12	30.00	2	7.00	-	17.00	

Table 3, shows that nearly 80 percent of the scholars were exposed to various courses on computer usage of which 84 percent of the scholars possessed good proficiency in windows platform and the remaining 16 percent of the scholars possessed good proficiency in Linux based system platforms. Nearly three fourth of the scholars possess good proficiency in at least one application software especially MS office. More than 50 percent of the student knew at least one programming language such as C,C++.

The scholars entered TNAU without any ICT exposure and proficiency. At least three pathways could be traced for the students' familiarising with ICT viz., (i) inside the campus (computer lab as part of course curricula) and (ii) outside the system – a few of the scholars took an initiative to learn the system application from their colleagues. (iii) Around 50 percent of the scholars underwent computer courses from APTECH, NIIT and other reputed institutions in Coimbatore, Tamil Nadu on their own.

The ANOVA 'F' value was found to be non significant for proficiency in platforms, applications and programming languages which implies that there was no statistically significant difference between the three categories of respondents namely UG, PG and Ph.D scholars

System Utility Profile

Nearly two third of the scholars are using Dell laptops and HP, Compaq, Mac and Sony are also among the priority list of the scholars. From table 4 it is clear that more than 50 percent of the scholars use laptops having RAM capacity of 2 GB since it is good enough for working on Windows Vista platform. Nearly 50 percent of the scholars are using 120 GB hard disk in their systems and 37 percent of the scholars are using 250 GB HDD in their systems for storage and the remaining are using 360 GB and less than 120 GB HDD categories. Nearly 70 percent of the scholars use at least one external Data storage Drive viz., CD/ DVDs, pen drives etc.,

Almost 90 percent of the scholars use only licensed operating systems (OS) ie. Windows and this shows the awareness among the scholars in using the licensed operating systems and their importance. Nearly 50 percent of the students operated the keyboard at medium speed (80-90 characters per minute). Most of the Ph.D., scholars (i.e.) 90 percent of them operated keyboard at a greater speed (108 characters per minute). Around 54 percent of the scholars had an experience of 1 to 2 years in handling system software. Almost two-third of the scholars spent an average of more than 4 hours per day in using computers.

Nearly 80 percent of the scholars use the system at an average of 1-2 hrs daily for preparing presentation and typing. Nearly 83 percent of the scholars use their laptops for checking mail and browsing at an average of 1-2 hrs per day. Around 64 percent of the scholars use their computers for entertainment at an average of 1-2 hrs per day. Hence on an overall perspective, scholars tend to use their computers on an average of 5-6 hrs per day for various purposes. This shows their interest and involvement in using the ICT and its components for their academic, curriculum and research purposes.

Table 4. System Utility

Contents		UG	Percent	PG	Percent	PhD	Percent	Total Percent	
RAM	<1 GB	2	5.00	1	3.00	-	-	3.00	0.331^{ns}
	1 GB	7	18.00	15	50.00	6	30.00	31.00	
	2 GB	29	73.00	12	40.00	7	35.00	**53**.00	
	3 GB	2	5.00	2	7.00	7	35.00	13.00	
HDD	<120 GB	5	13.00	2	7.00	-	-	8.00	0.353^{ns}
	120 GB	27	68.00	12	40.00	3	15.00	**47**.00	
	250 GB	7	17.00	16	53.00	10	50.00	37.00	
	360 GB	1	2.00	-	-	7	35.00	8.00	
External Data Storage Devices Available	CD/DVD	26	65.00	17	57.00	17	85.00	**67**.00	0.733^{ns}
	Pen Drive	14	35.00	12	40.00	3	15.00	32.00	
	External Hard Disk	-	-	1	3.00	-	-	1.00	
OS Used	Licensed	37	93.00	24	80.00	20	100.00	**90**.00	0.211^{ns}
	Pirated	3	7.00	6	20.00	-	-	10.00	
Keyboard operation	Speed	17	43.00	8	27.00	18	90.00	48.00	0.867^{ns}
	Medium	23	57.00	20	66.00	2	10.00	**50**.00	
	Slow	-	-	2	7.00	-	-	2.00	
Experience in Handling System Software	1-2 hrs	26	65.00	17	57.00	6	30.00	**54**.00	0.771^{ns}
	2-4 hrs	6	15.00	6	20.00	12	60.00	24.00	
	>4 hrs	8	20.00	7	23.00	2	10.00	22.00	
Time Spent Over Computer	1-2 hrs	10	25.00	10	33.00	5	25.00	28.00	0.699^{ns}
	2-4 hrs	10	25.00	7	23.00	13	65.00	33.00	
	>4 hrs	20	50.00	13	44.00	2	10.00	**39**.00	
Preparing Presentations and Typing	1-2 hrs	30	75.00	19	63.00	20	100.00	**77**.00	0.923^{ns}
	2-4 hrs	-	-	5	17.00	-	-	5.00	
	>4 hrs	10	25.00	6	20.00	-	-	18.00	
Mail Checking and Browsing	1-2 hrs	30	75.00	27	90.00	18	90.00	**83**.00	0.447^{ns}
	2-4 hrs	3	8.00	-	-	2	10.00	5.00	
	>4 hrs	7	17.00	3	10.00	-	-	12.00	
Movies, Games and Entertainment	1-2 hrs	22	55.00	20	67.00	16	80.00	**64**.00	0.829^{ns}
	2-4 hrs	2	5.00	2	7.00	4	20.00	9.00	
	>4 hrs	16	40.00	8	26.00	-	-	27.00	

Higher amount of exposure and usage behavior of ICT and its components by TNAU scholars are due to the reason that, they had been facilitated to acquire the computer system/laptops at the entry level of admissions in UG/PG/PhDs.

The ANOVA "F' value calculated to identify the significant difference among the categories of students was found to be non significant for all the criteria studied for system utility. Hence it could be inferred that there was no statistically significant difference among the three categories of students.

Internet Utility Profile

From table 5, it can be inferred that nearly 30 per cent of the scholars used their laptops for mostly downloading subject materials from various internet sources, 20 per cent used for new updates in their study areas, 12 per cent used for mailing and chatting, 11 per cent used for reading online journals and magazines and 7 per cent used for social networks like twitter, face book and other online communities. Despite the other utilities of Internet, it has mostly been used for academic and career related work/activities.

Table 5. Internet Utility

Utility	UG	Percent	PG	Percent	PhD	Percent	Total percent	F value
Downloading abstracts	6	15.00	7	23.00	12	60.00	28.00	
Reading online journals and magazines	7	18.00	2	7.00	1	5.00	11.00	
Viewing online teaching materials and avoiding video streamed version	1	2.00	-	-	-	-	3.00	
Membership in data bank sites	1	2.00	-	-	1	5.00	9.00	
Surfing for subject materials	9	23.00	5	17.00	-	-	15.00	29.37**
Downloading movies and songs	5	12.00	1	3.00	-	-	7.00	
Using Social Networks	-	-	-	-	1	5.00	7.00	
Mailing and chatting	5	12.00	4	13.00	2	10.00	12.00	
Conferencing (video/audio)	-	-	-	-	-	-	-	
News	5	13.00	9	30.00	3	15.00	19.00	
Others (specify)	1	3.00	2	7.00	-	-	-	

Further, TNAU has provided WiFi Connectivity at classrooms, hostels, library and Computer lab which might be the reason for enhanced internet usage behavior.

The 'F' value was found to be significant at 1 per cent level of probability which means that there existed significant difference among UG, PG and PhD students in terms of their internet utility.

Utility of Computer Centre

From table 6, it is found that almost 65 per cent of the scholars used the University Computer Centre for Academic purposes, 28 per cent of Scholars used the Computer Centre for career options and studies abroad and only 5 per cent used it for entertainment purpose. Upto 40 per cent of scholars used the university computer centre occasionally and 60 per cent are rarely using, or even not using the university computer centre. This is just because of the availability of laptops and WiFi network at Hostels. Further, many of the computers in University computer centre are not protected with anti-virus updation. This is another reason that students have reduced the usage of computer centre systems. Similarly, more than 95 per cent of the scholars protect their laptops with anti-virus mechanism. This shows the greater level of awareness among scholars in protecting their system from virus. More than 75 per cent of the scholars have not used the digital library. This indicates non availability of required digital infrastructure and lack of awareness among the students on the usage. Further, the result shows that the existing journals and periodicals in the Digital Libraries are not updated.

Table 6. System and Computer Centre Utility

Utility	UG	Percent	PG	Percent	PhD	Percent	Total Percent	F value
System Utility								
Reading	16	40.00	5	17.00	5	25.00	29.00	9.22*
Downloading	-	-	6	20.00	8	40.00	16.00	
Presentations	5	12.00	15	50.00	6	30.00	29.00	
Entertainment	12	30.00	2	7.00	1	5.00	17.00	
Examinations	4	10.00	-	-	-	-	4.00	
Mailing and chatting	3	8.00	2	6.00	-	-	5.00	
Computer Centre Utility								
Academic	20	50.00	24	80.00	15	75.00	65.00	2.61^{ns}
Entertainment	6	15.00	-	-	2	10.00	5.00	
Career	8	20.00	3	10.00	2	10.00	14.00	
Higher studies abroad	5	12.00	2	7.00	1	5.00	14.00	
Others	1	3.00	1	3.00	-	-	2.00	

The ' F' value was significant at five per cent level of probability which implies that there existed significant difference among three categories of students with respect to system utility. With respect to the student's utility of the computer centre the 'F' value was found to be non significant

Attitude of Scholars towards Internet and Libraries

More than 35 percent of scholars feel that both internet and traditional libraries are of equal importance. Forty percent of the scholars disagree that internet is superior to traditional libraries. More than 25 percent agree that Internet is superior. The wide variation in the attitude of scholars on the statement that "Internet is superior to traditional Libraries" is due to the ease of access of the Computer Centre and effective utilization of Internet facilities and WiFi enabled hostels which extends the information to the rooms rather than searching for information at the library.

More than 50 percent of the scholars feel that the availability of WiFi has reduced their utility of Traditional Libraries and more than 40 percent feel that WiFi facility has no impact over their usage of traditional libraries. Though ICT and its components are driving the field of education with extreme dominance still, 70 percent of the analyzed respondents revealed a positive and favourable attitude towards traditional libraries which throws a vast scope for future research on it.

Online Examinations (UG Only)

Online Examinations for farm graduates is an innovative idea which was initiated by TNAU. Nearly 45 percent of the scholars have a good performance record in online examinations and more than 55 percent of the scholars have average performance record in online examinations. Students say that it is easy for them to it answer the 'fill in the blanks', 'multiple choice' and 'match the following'. They found it difficult to answer the easy type of questions with flow chart, diagrammatic presentation in the initial period (up to 2 semesters). This performance can be justified by the following discussion. More than 60 percent of the scholars feel that their typing speed affects their answer flow in online examinations. More than 60 percent of the scholars prefer written examinations, 30 percent prefer both written and online exams together. More than 60 percent of the scholars prefer both Mid-semester and final exam to be online but only to a certain extent i.e, objective type questions alone. More than 60 percent of the scholars prefer only objective type of questions in online examinations. Nearly 60 percent of the scholars feel that online exams do not at all affect the vocabulary, more than 20 percent feel that online exams absolutely affect the vocabulary. Nearly 70 percent of the scholars express that online examinations have effected

and reduced their writing skill. More than 70 percent of the scholars expressed that malpractice exists in online exams. Fifty percent of the scholars feel that their course teachers update their course materials regularly. More than 60 percent of the scholars expressed that their course teachers provide online course materials to them on internet. Being a pioneer in implementing innovations like e-learning, modern classrooms, networking, online courses, e-course materials and online examinations, the measures to improve the present situation and rectify the constraints for the future must be considered. Despite improving the teaching learning process, enhancing the learning situation, online examinations have its own drawbacks to a certain extent as discussed in this area.

Constraints / Problems faced by TNAU Scholars in Using ICT Tools

Invariably everyone felt that the internet speed in the library, hostel and computer labs is slow and the rate of downloading files sluggish, due to low bandwidth connectivity access through wireless fidelity networks and many users accessing the connectivity simultaneously (Table 7). Other constraints experienced by the students are listed in the table.

Table 7. Constraints / Problems faced By TNAU Scholars in their order of priority (n=90*)

S.No.	Constraints	Mean score	Rank
1.	Low speed , poor capacity and very low download rate of WiFi networks in the hostels	83.40	I
2.	Poor signal strength of WiFi in the hostels	74.64	II
3.	Poor or inadequate availability of interactive multimedia, self- learning modules, online class courses, simulated course materials etc.	72.52	III
4.	Descriptive type of questions in online examinations	69.70	IV
5.	Poor or inadequate virus protection mechanism at the university computer centre	68.15	V
6.	Lack of adequate training facilities	54.22	VI

** Multiple Responses*

Suggestions for Improvement

During the study the scholars came out with many valuable suggestions to overcome the problems faced by them in using ICT and its components effectively. Some of the significant suggestions were identified and are given below in order of their priority.

01. Increasing the overall efficiency of WiFi networks in the aspects of, signal strength, capacity, download rate and increased Bandwidth etc., so as to bring out its maximum use efficiency.

02. Developing interactive multimedia course materials, self-learning modules, arranging e-classes, providing simulation course materials will improve student's efficiency in using ICT.

03. Online exams could be preferred only for objective type questions and a perfect blend of both online and written exam would serve the best to the student community.

04. Providing a better anti-virus mechanism in all computers and arranging for regular and need based training programmes for scholars to improve their ICT use efficiency.

05. Above all, a proper feedback mechanism should be designed so as to obtain and update feedback from scholars to revitalize the components of ICT and e-learning in education.

Conclusion

A great significance is seen in using ICT and its components/tools for improving the education scenario of Agriculture and Rural Development as identified through this study. Almost 80 percent of the respondents were highly motivated and empowered by e-learning. However it also throws light on the dramatic change in the utility pattern of existing library resources which is reduced nearly 70 percent just because of ICT and its components. More than 70 percent of the respondents feel that descriptive type of answers in online examinations has severely reduced their exam performance. Developing interactive multimedia course materials, self-learning modules, organizing e-classes, providing simulation course materials will improve student's efficiency in using ICT tools. Validating and updating the course materials and technical components should be considered through proper feedback and training mechanism.

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