Teacher's Professional Use of Information and Communication Technology in Secondary Schools in Tamil Nadu, India

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Abstract

The purpose of the study is to evaluate secondary school teachers' abilities to use Information and Communication Technology (ICT) in schools in Tamil Nadu, India. Questionnaires method was used for data collection. Around 200 questionnaires were distributed to secondary school teachers and headmasters, in which 157 were completed and returned. Descriptive statistics principles with SPSS software were used for the analysis of the data. The study reports that use of computer and internet exist between the teachers of different age groups and various backgrounds. There were evidence of significant difference in the use of information and communication technology between teachers in different age group and location. The analysis also reports that there was no significant difference in the use of ICT by the gender. Thus, the overall finding of the study reports that teachers are moderately using ICT for professional purposes.

Keywords: internet use, computer accessories, manage document

1. Introduction

Information and communication technology (ICT) is generally used in schools for many teaching and non teaching activities. In India, the Information and Communication Technology (ICT) scheme was introduced to schools in December 2004. The objective of the scheme was to "develop the ICT skills of students to face various economical and social challenges". Teachers need efficiency in ICT skills because to help students improve their ICT skills and for classroom teaching. The ICT scheme was a joint project between the central and state governments. Under the scheme, the Tamil Nadu government provided ICT equipment including computers, printers, multimedia projectors, Uninterruptible Power supply (UPS), CDs, and educational software along with required furniture to government schools. All high school and higher secondary schools were given internet connection. Teachers received induction and refresher training to ensure ICT-enabled teaching (Ministry of Human Resource Development, Government of India, 2010). Since its introduction, ICT has become the normal part of secondary education in Tamilnadu. This study intends to evaluate the professional use of ICT by secondary school teachers in selected districts in Tamil Nadu since the implementation of the ICT scheme.

1.1 Research Question

H1: Basic computer knowledge is moderate among the secondary school teachers

H2: There is a significant difference in computer usage by gender, age and school location

1.2 Literature Review

According to Buabeng (2012) the implementation of ICT in schools is necessary to enrich the ability, skills and knowledge of the students and prepare them according to their challenges. Educational institutions should enrich the workplace so that technology use can be enhanced in schools.

According to Gulbahar and Guven (2008) information and communication technology is a tool that can be used to enhance the quality of teaching various subjects. Thus, it is important for teachers to understand and use information and communication technology. So that teacher's attitude is one of the identification of using ICT in the professional field.

A study in Taiwan explored the use of computers for different activities in the teaching profession like using spreadsheets for accessing grades for students, preparing materials, teaching within the classroom, and

motivating students to use the internet to gather information and for collaborative learning like sharing information and interaction. The results also showed that the majority of the teachers use computers for making spreadsheets for record the grades of the students. Further it shows Internet was used by the teacher for gathering information on average (Hung & Hsu, 2007).

The program "Preparing Tomorrow's Teachers to Use Technology" helps to prepare teachers more effectively to use technology as a teaching tool (U.S. Department of Education, 2002). Russell et al. (2003) reported that teachers use technology in different ways, such as using computer based technology for instructional methods, motivating students to use technology for collaborative learning, using computers for communication purposes, preparing material for classroom teaching, maintaining records and using it for personal reasons.

Russell et al. (2003) further showed that novice teachers had higher levels of knowledge and practice in using ICT than veteran teachers in their professional field. The requirement is to produce the in-service teachers with better preparation of technology integration in their teaching. The internet aids the teachers in conducting direct research on classroom topics. In addition, it allows for better communication with other teachers to further discuss those topics (Becker, 1999).

Afshari (2008) reported that in Iran, computers are used for administration purposes like maintaining records of the student which includes marks, grade sheet, section or class order information about students and their activities. The result shows that majority of the principals are using computers once in a week for administrative purposes and teachers use of computer for administrative purposes is found to be less.

2. Methodology

2.1 Data Collection and Procedure

Table 1. Demographic profile

Demographic variables	Subdivision of the variables	Number	Percentage
Gender	Male	47	29.93630
	Female	110	70.06369
Age	22-30 years	60	38.2165
	31-40 years	48	30.5732
	41-50 years	37	23.5668
	51 and above	12	7.64331
School location	Urban	76	48.40764
	Semi Urban	55	35.03185
	Rural	26	16.56051

Survey of teachers, using a survey instrument was conducted to collect data on the use of ICT by the secondary school teachers in Tamil Nadu, India. A questionnaire is developed to study the use of computers and internet by the teachers. The first part of the questionnaire deals with the respondents' demographic information – gender, age, and location of the school in terms of rural, semi urban and urban area. The second part of the questionnaire deals with the usage of computers and the internet by the school teachers.

The use of computers and internet by the teachers is divided into four sub divisions: frequency of their usage of computer, frequency of their usage of computer accessories, their use of internet for communication and other purposes, and their use of internet for instruction. The questions have statements with a 3 point Likert scale.

The questionnaire was distributed to secondary school teachers of select schools in Tamil Nadu. Out of 200 participants, 157 completed responses (82.6%) and returned the questionnaires. The respondents are teachers and headmasters from 21 schools in the three districts of Tamil Nadu such as Salem, Coimbatore, Madurai. Majority of the respondents, about 70% were female and the male respondents were about 30%.

The age group is divided into four parts such as 22-30, 31-40, 41-50, 51 and above. Number of schools increased and so young teachers is getting opportunity to work in schools. This may be the reason for getting higher

response rate form 22-30 age group.

The school location is divided into three parts such as urban, semi-urban and rural areas. In Tamil Nadu, majority of schools are located in urban and semi urban areas. Number of teachers in each school is also higher in urban and semi urban than the rural areas. This may be reason for getting higher response rate from urban areas. The demographic profile of the respondents is shown in the table 1.

The usage category is divided into four parts such as managing documents, computer accessories, and internet for general purpose, internet for academic purpose. "Managing documents" category include use of MS word documents, excel documents, power point, E-mail, internet use create, open, save, change/update documents and use web search engines. Computer accessories category includes use of printer, scanner, LCD projectors and educational CD/DVD. 'Internet for general purposes' category include searching websites for general information, send and organize emails, use emails for personal communication, use emails to communicate with other teachers and headmasters, and send school related information to school administrators and use internet for entertainment. 'Internet for academic purpose' category include using internet for searching academic course information, download documents/materials related to courses, use online link to purchase books, look for educational videos, find the relevant websites for academic related information, to download and use maps, charts, diagram and art design in the classroom and use of power point in the classroom teaching.

Descriptive statistics and other analysis were carried out with SPSS. Using this software, correlation and ANOVA test were conducted.

The reliability alpha α of the questionnaire is found to be 0.92. This indicates strong reliability and authentication of the questionnaire.

2.2 Descriptive Statistics

Table 2. Descriptive statistics

Variables	N	Mean	Std. Deviation
Manage documents	157	1.7898	.66152
Computer_Accesseries	157	1.5924	.59261
Internet_general	157	1.5651	.55971
Internet_subject	157	1.7288	.57078
Valid N (listwise)	157		

Table 2 shows the Descriptive statistics of Mean and Standard Deviation for the usage of computer and internet of the respondents in detail. The mean value for use of computer for managing documents is 1.7898 (SD = 0.66152), the manage document used by teachers in schools is high than the other uses. The mean value for the use of computer accessories is 1.5924 (SD = .59261). The computer accessories used by the teachers in schools is moderate than other uses. The mean value for the use of internet for communication is 1.5651 (SD = .55971). The internet for general search used by the teachers in schools is moderate than other uses. The mean for the use of internet to handle subject information is 1.7288 (SD = .57078). The internet use to handle subject information by the teachers in schools is moderate than other uses. The result of the descriptive statistics shows that teachers use computers to manage documents more frequently than for other purposes.

2.3 Pearson Correlation

Table 3. Pearson correlation

	Manage documents	Computer accessories	Internet general	Internet subject
Manage documents	1	.748[**]	.708[**]	.739[**]
Computer accessories	.748[**]	1	.708[**]	.723[**]
Internet general	.708[**]	.708[**]	1	.875[**]
Internet subject	.739[**]	.723[**]	.875[**]	1

**: Correlation is significant at the 0.01 level (2-tailed).

Pearson correlation (table 3) analyses were used to find out the correlation between the different usage of computer and internet by secondary school teachers. From the correlation analysis, it is found that each usage category is positively correlated with every other usage category. The highest correlation is found between the usage categories 'Internet for general' and 'Internet for subject'(r= 0.875). The usage category "managing documents" is positively correlated with computer accessories (r =.748), with "internet for subject" (r = .739), with 'computer in general' (r = .708). The usage category "computer accessories" is positively correlated with "internet for subjects" (r = .723).

3. Results of Analysis of Variance (ANOVA)

3.1 Gender with Usage Category Variables

Table 4. Gender with usage category variables

Usage category variables		Sum of Squares	df	Mean Square	F	Sig.
Manage_documents	Between Groups	.119	1	.119	.270	.604
	Within Groups	68.149	155	.440		
	Total	68.268	156			
Computer_Accessories	Between Groups	.041	1	.041	.116	.734
	Within Groups	54.745	155	.353		
	Total	54.786	156			
Internet_general	Between Groups	.051	1	.051	.163	.687
	Within Groups	48.820	155	.315		
	Total	48.871	156			
Internet_subject	Between Groups	.014	1	.014	.043	.835
	Within Groups	50.810	155	.328		
	Total	50.824	156			

Analysis of variance results in Table 4 (Gender with usage category variables) indicate that there is no significant difference in the usage category and gender. Hence, male and female do not differ in their usage level when using computers for Managing documents, using Computer Accessories, using Internet for general purposes and using Internet for academic purposes.

3.2 Age vs. Usage Category Variables

Table 5. Age vs. usage category variables

		Sum of Squares	df	Mean Square	F	Sig.
Manage_documents	Between Groups	17.195	3	5.732	17.170	.000
	Within Groups	51.073	153	.334		
	Total	68.268	156			
Computer_Accesseries	Between Groups	11.104	3	3.701	12.965	.000
	Within Groups	43.682	153	.286		
	Total	54.786	156			
Internet _general	Between Groups	9.409	3	3.136	12.160	.000
	Within Groups	39.462	153	.258		
	Total	48.871	156			
Internet _subject	Between Groups	11.020	3	3.673	14.120	.000
	Within Groups	39.804	153	.260		

From the table 5 (Age Vs usage category variables), all the usage categories are statistically significant with the demographic variable 'Age' in the ANOVA analysis. The 'Manage documents' has the F value as 17.170 with the significant difference (.000). 'Age' has statistically significant influence on how the individual manages the documents in the professional field. The usage category 'Computer Accessories' has the F value as 12.965 with significant difference (.000). 'Age' has statistically significant influence on how the individual use the 'Computer Accessories'. The usage category 'Internet for general' purpose has the F value as 12.160 with the significant difference (.000). 'Age' has statistically significant influence on how the individuals use 'Internet for general' purpose. The usage category 'Internet for academic purposes' has the F value as 14.120 with the significant difference (.000). 'Age' has statistically significant influence on how teachers use internet for their subjects.

3.3 School Location vs. Usage Category

Table 6 (School area Vs usage category variables) indicates that all the usage categories are statistically significant with the demographic variable 'school location' in the ANOVA analysis. The usage category 'Manage documents' has the F value as 9.585 with the significant difference (.000). 'School area' has statistically significant influence on how the individual managing the documents in the professional field. The usage category 'Computer Accessories' has the F value as 8.516 with the significant difference (.000). 'School area' has statistically significant influence on how the individual use the 'Computer Accessories'. The usage category 'Internet for general' has the F value as 5.929 with the significant difference (.000). 'School area' has statistically significant influence on how the individual use 'Internet for general' purposes. The usage category 'Internet for subject' has the F value as 4.597 with the significant different (.001). 'School area' has statistically significant influence on how teachers use internet for their subjects

Table 6. School area vs. usage category variables

		Sum of Squares	df	Mean Square	F	Sig.
Manage_documents	Between Groups	5.023	2	2.511	6.115	.003
	Within Groups	63.245	154	.411		
	Total	68.268	156			
Computer_Accessories	Between Groups	6.213	2	3.107	9.849	.000
	Within Groups	48.573	154	.315		
	Total	54.786	156			
Internet_general	Between Groups	4.668	2	2.334	8.131	.000
	Within Groups	44.203	154	.287		
	Total	48.871	156			
Internet_subject	Between Groups	7.360	2	3.680	13.038	.000
	Within Groups	43.464	154	.282		
	Total	50.824	156			

4. Discussion

This study reported that the 'Manage documents' is frequently used than the other applications by secondary school teachers.

The correlation analysis shows teachers moderately use computers for teaching subjects and for other administrative purposes. Most of the schools have less computer facilities, so teachers have less opportunity to utilize computers for their professional purposes. Facilities like computers, internet connection and other equipments are inadequate in schools.

Internet use for 'general purpose' is highly correlated with 'Internet for subject' variable. It shows that Internet is highly used in schools for communication and for subject relevant information rather than other purposes. With the advancement in communication technology, e-mail is used as an important medium for the communication.

In Tamilnadu, nearly all the schools have started to use internet for communication purposes. All the government orders, circulars, and other academic related information are passed from the State education and district education department to the schools through emails. School reports, student enrollment statistics and other academic statistics are sent from the schools to the education department using emails. Generally, internet use is high than the use of the computer tools in the work environment. Hung, Y.-W., and the Hsu, Y.-S. (2007) indicate that, Taiwan secondary school science teachers give first priority to use internet for searching information and give only second preference for job oriented activities.

This paper established that there is a positive correlation between the computer and internet use by teachers. Albirini (2004), states, teachers' positive attitudes towards ICT is one of the key elements for proper ICT usage in school. This study also reveals the same.

The results of ANOVA show that there is no significant difference in the use of computer and internet by gender. Teacher's interest and their computer knowledge are mainly responsible for use of ICT in schools. Hung and Hsu (2007) state that there is a significant difference in the use of application of technology in instruction with gender and age. Based on the official school policy in Taiwan, spreadsheets are used to prepare the student grade by the secondary school teachers.

4.1 TUKEY Test-Age

Table 7. Multiple comparisons

Tukey HSD						95% Confidence Interval	
Dependent Variable	(I) age	(J) age	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Manage documents	22-30	31-40	.51548*	.11188	.000	.2249	.8061
		41-50	.63179*	.12077	.000	.3181	.9455
		50 &above	1.04524*	.18270	.000	.5707	1.5198
	31-40	51 & above	.52976*	.18647	.026	.0454	1.0141
Computer_Accesseries	22-30	31-40	.42396*	.10347	.000	.1552	.6927
		41-50	.52995*	.11169	.000	.2398	.8201
		51& above	.80417*	.16897	.000	.3653	1.2431
Internet_general	22-30	31-40	.38988*	.09835	.001	.1344	.6453
		41-50	.49807*	.10616	.000	.2223	.7738
		51 & above	.72619*	.16060	.000	.3090	1.1433
Internet for subject	22-30	31-40	.35179*	.09877	.003	.0952	.6083
		41-50	.50019*	.10662	.000	.2233	.7771
		51 & above	.87857*	.16129	.000	.4596	1.2975
	31-40	51 & above	.52679*	.16462	.009	.0992	.9544

*: The mean difference is significant at the 0.05 level.

4.1.1 Computer for Manage Documents

It is found from ANOVA test that there is a significant difference in the computer usage between teachers of different age groups. TUKEY test is done to find out which age group differed significantly from the other age groups. Table 7 (TUKEY Test-Age) shows the TUKEY test results for the independent variable age. From the table, it is found that teachers belonging to the age group '22-30 years' differed significantly with all other age groups namely 31-40 years, 41-50 years and 51 years and above. The difference in the mean of computer usage between the age group 22-30 years and the other age groups reveals that this younger group's computer usage is higher than rest of the age groups. Also, it is found that the highest difference (1.05) in mean exists between this younger group of teachers and teachers who are 51 years old and above. The younger group has an opportunity to use computer more frequently during their studies. Hence, they do not have any difficulty in using computer

in their profession. Teachers, who belong to the age group 51 years and above, may have completed their studies before 25 years or so. Computer was just making its entry then. Although these teachers are in the teaching profession for a long time, they did not have much opportunity to use computers. This may be the reason for their less usage of computer in their profession. Similarly, teachers belonging to the age group 31-40 years differ significantly with teachers who are 51 years old and above in their computer usage. The difference in mean (0.53) shows that the group 31-40 year's usage of computers is more.

4.1.2 Use of Computer Accessories

It is found from ANOVA test that there is a significant difference in the use of computer accessories between teachers of different age groups. TUKEY test is done to find out which age group differed significantly from the other age groups. Table 7 (TUKEY Test-Age) shows the TUKEY test results for the independent variable age. From the table, it is found that teachers belonging to the age group 22-30 years' differed significantly with all other age groups namely 31-40 years, 41-50 years and 51 years and above. The difference in the mean of computer accessories between the age group 22-30 years and the other age groups reveals that this younger group's use of computer accessories is higher than rest of the age groups. Also, it is found that the highest difference (0.80) in mean exists between this younger group of teachers and teachers who are 51 years old and above. Young teachers have completed their studies in computer era where they have lot of opportunities to know and use computer accessories more frequently. In olden days, educational videos and projectors were not used in every class room. Lack of such equipments has not given the older teachers an opportunity to use more computer accessories.

4.1.3 Internet for General Purpose

It is found from ANOVA test that there is a significant difference in the internet for general between teachers of different age groups. TUKEY test is done to find out which age group differed significantly from the other age groups. Table 7 (TUKEY Test-Age) shows the TUKEY test results for the independent variable age. From the table, it is found that teachers belonging to the age group 22-30 years' differed significantly with all other age groups namely 31-40 years, 41-50 years and 51 years and above. The difference in the mean of internet for general purposes between the age group 22-30 years and the other age groups reveals that this younger group's use of internet for general is higher than rest of the age groups. Also, it is found that the highest difference (0.72) in mean exists between this younger group of teachers and teachers who are 51 years old and above. Young teachers have more exposure to usage of internet and hence more interest in internet, social networks and networking. Young people tend to use social networks more frequently, and use email for communication. They use search engines for information and are very comfortable in using computers for internet. The older group, on the other hand, did not have the internet availability in their times and hence had less opportunity to use internet.

4.1.4 Internet for Subject

It is found from ANOVA test results that there is a significant difference in the use of internet for academic purposes between teachers of different age groups. TUKEY test is done to find out which age group differed significantly from the other age groups. Table 7 (TUKEY Test-Age) shows the TUKEY test results for the independent variable age. From the table, it is found that teachers belonging to the age group 22-30 years differed significantly with all other age groups namely 31-40 years, 41-50 years and 51 years and above. The difference in the mean of internet for academic purposes between the age group 22-30 years and the other age groups reveals that this younger group's use of internet for academic purposes is higher than rest of the age groups. Also, it is found that the highest difference (0.87) in mean exists between this younger group of teachers and teachers who are 51 years old and above. Similarly, teachers belonging to the age group 31-40 years differ significantly with teachers who are 51 years old and above in their use of internet for academic purposes. The difference in mean (0.52) shows that the group 31-40 years use of internet for academic purposes is more. Senior teachers are academically very experienced. But they have not received any training to incorporate computer and technology in their teaching profession

In Tamilnadu, young teachers are using computers to a larger extent than the senior teachers. For the school administration purposes like email communication and record keeping, computers are used by school headmasters. Headmasters in most of the schools have the working knowledge of computers than the other teachers. Teachers have very less opportunity to use computers in schools for academic purposes.

4.2 TUKEY-Test School Location

Table 8. Multiple comparisons

						95% Confidence Interval	
Dependent Variable	(I) school_area	(J) school_area	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Manage documents	Urban	Rural	.34529*	.14560	.049	.0007	.6899
	Semi urban	Rural	.36357*	.11345	.005	.0951	.6321
Computer_Accesseries	Urban	Rural	.43877*	.12760	.002	.1368	.7407
	Semi urban	Rural	.37548*	.09942	.001	.1402	.6108
Internet_general	Urban	Rural	.36003*	.12172	.010	.0720	.6481
	Semi urban	Rural	.33746*	.09484	.001	.1130	.5619
Internet for subject	Urban	Rural	.45590*	.12070	.001	.1702	.7416
	Semi urban	Rural	.42163*	.09405	.000	.1991	.6442

*: The mean difference is significant at the 0.05 level.

4.2.1 Computer for Manage Documents

Table 8 (TUKEY-test school location) indicates that there is a significant difference in the use of computer and internet with location of the school. Significant difference exists between rural schools and urban schools and semi urban schools in the using computers for managing documents. Mean difference in usage between urban and rural school is .34529 and mean difference in usage between semi urban and rural school is .36357. In Tamil Nadu, urban school teachers are using computers more than the rural teachers. This may be due to the availability and accessibility of computers in urban areas. Teachers working in urban schools have the opportunity to use computers in places like private computer centers, internet shops. Hence, these teachers have good practice in the use of computers. In rural location, lack of computer facilities is one of the reasons for low level use by the teachers. Therefore, teachers in rural schools depend on government training programs for enhancing their ICT skills.

Al-Zaidiyeen (2010) mentioned that in Jordan schools ICT use is very low among teachers for educational purposes especially in rural schools. As mentioned by Lau and Sim (2008), there is a frequent use of ICT for instructional support rather than for 'management' and 'communication use'.

4.2.2 Use of Computer Accessories

There is a significant difference in the use of computer accessories with location of the school. Significant difference exists between rural schools and urban schools and semi urban schools in the use of computer accessories. Mean difference in the usage between urban and rural school is .43877 and mean difference in usage between semi urban and rural school is .37548. More opportunities are available to use computer accessories in urban location. Hence, the urban and semi urban teachers have more chance to use computer equipments than the rural teachers. The computer equipments are minimally available in rural schools. Unavailability of computer equipments may be the reason for low use of computer accessories by rural teachers.

4.2.3 Internet for General Purpose

There is a significant difference in the use of internet with location of the school. Significant difference exists between rural schools and urban schools and semi urban schools in the use of internet for general purpose. Mean difference in usage between urban and rural school is .36003 and mean difference in the usage between semi urban and rural school is .33746. In schools internet is used for e-mail communication and to search general information. Schools have internet connection on limited computers and training of the teachers to use internet is also very less. Teachers in rural location have no options to use internet for communication and general searching.

There is a significant difference in the use of internet for academic purpose with location of the school. Significant difference exists between rural schools and urban schools and semi urban schools in the using computers for managing documents. Mean difference in usage between urban and rural school is .45590 and mean difference in usage between semi urban and rural school is .42163. Rural teachers are not trained to use internet for their subject. Lack of technology supportive center to train in rural location may be the reason for low usage of internet for subject related information.

5. Conclusion and Recommendation

This study reports that school teachers use technology moderately in their teaching profession. Young teacher's (age group 22-30 years) use computer and internet more often than teachers of other age groups. Use of ICT by senior teachers is found to be low. ICT equipment in schools is moderately available for educational purposes. So, teachers' use of computers is minimal for educational purposes. Teachers teaching language subjects use computers less frequently than all other teachers. In Other subjects such as physical education, yoga, teachers' use of ICT in their profession is found to be moderate. There is lack of equipment and lack of support to use ICT in teaching subjects like drawing, yoga, and physical education. In Tamil Nadu, headmasters use internet more frequently for communication with higher officials, sending reports, receiving emails regarding government orders and administration related activities with education department. All the schools have one or more computers but very limited internet connection. Teachers need to use their ICT knowledge in appropriate situations in instructions and for other activities in their work environment. Therefore, in depth training is needed for teachers to use computers, use internet for general and academic purposes and to handle computer accessories. In rural location, teachers have moderate computer knowledge and moderate use of internet for teaching academic subjects. According to the global standards, teachers should have better expertise in handling ICT for effective and better teaching. Teacher's positive attitude plays an important role for the successful integration of academic activities and usage of ICT in schools. Teachers should be encouraged to use ICT in schools and should incorporate computing technology in the school curricula.

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