

ICTs as Enabler in Higher Education

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Abstract

The paper aims at examining impact of Information and Communication Technologies (ICT) on higher education and to identifying major impediments that have resulted in slow penetration of ICTs in higher education institutions in rural India. The study is based on primary survey of students studying at graduate and post graduate levels. A sample of 72 students come from four higher education institutions located in Sitapur, a district selected as one of the six e-districts by the Government of Uttar Pradesh. The survey was conducted during October 2012 and January 2013. Findings of the study suggest that while affiliating university is taking all possible measures to facilitate students to improving the quality of education and access to digitized critical literature needed for higher education, the technological and physical infrastructure in rural areas is still a major hindrance in capitalising benefits of ICT revolution. The paper finds evidence to suggest that faculty also needs to be motivated to use more modern and effective ICT led teaching tools. Based on the findings of the study we recommend that cyber-café may be set up in the premises of the institutions on Public-Private-Partnership (PPP) model so that ICT could impact higher education in rural India in a more effective manner.

Keywords: ICTs, Higher Education, Rural-Urban Divide, Chi-Square, India

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INTRODUCTION

The benefits of use of Information and Communication Technologies (ICT) in any sphere of life are no longer unknown. That is the reason why ICT revolution has diffused so rapidly in India and elsewhere. However, the uneven diffusion of ICT created digital divide among different segments of the society. For instance, there is digital divide between rich and poor (Lal and Paul, 2004) and there exists rural-urban digital divide. The field of education has not been untouched with this divide. Institutions located in urban areas have better access to new technologies compared to the institutions located in rural or semi-urban areas. Hence urban academic institutions can equip students with better knowledge of ICT.

Before proceeding further, few empirical studies done on the use of ICT in higher education are discussed. One such study by Brown and Liedholm (2002) finds that ICT in higher education can be more useful in some activities such as student-university communication, searching of reading material, online accessibility of literature, and use of ICT led teaching methods. The authors did not find much use of very advanced ICT tools such as virtual classrooms. On the other hand, several studies found challenges as well as opportunities in using ICT in higher education (James and Hopkinson, 2009; Loing, 2005). James and Hopkinson (2009) found that use of ICT in higher education has growing social impact. On the other hand, Loing (2005) argued one of the several challenges as “the diversification of learner population, and of institutions and programmes; the permanent upgrading of knowledge contents and a growing need for lifelong learning: here again universities have to meet this challenge and can probably do it only with the help of ICT educational applications”. Lal (2007) in his book emphasized that more ICT savvy managers and workers are needed in the era of globalisation.

In Indian context, it was in early 1990s, the Department of Electronics set up a consortium of top Indian institutions such as Indian Institute of Technologies and Indian Institute of Science, Bangalore. An educational network called Education and Research NETwork (ERNET) came into existence due to efforts of these institutions and they were the first to use digital technologies. Realising the tremendous potential of ICT, the Internet was formally launched in India on August 15, 1995 for public and other institutions. Since then ICT have penetrated in almost all the academic

institutions located particularly in urban areas. The penetration of ICT in academic institutions located in rural areas is still dismal despite the several initiatives taken by public and private sector. One of the leading private sector companies that are engaged in diffusion of ICT in education is EDUCOMP. Another path breaking initiative undertaken by TATAs is TATA ClassEdge. They have developed very cost effective ICT led teaching tools such as touch screen boards and Internet and Intranet based teaching methods. The Government of India has also taken up several initiatives so that every student can reap the benefits of ICT. The launch of special satellite, EDUSAT, exclusively for education is a case in point.

This paper seeks to identify major impediments that have resulted in slow penetration of ICT in higher educational institutions in rural India and also to identify mechanism so that rural-urban digital divide is reduced if not eliminated. Before proceeding further, some background of Sitapur district which has been selected for the study is presented. Geographical location of the district on the map of Uttar Pradesh is depicted in Figure 1.

Figure 1: Location of Sitapur



As far as mapping of the district from higher education institutions point of view is concerned, there are fifty-four¹ degree colleges in the district. Out of these, two are government degree colleges and four are aided by the government. The remaining are self-financed institutions constituting 88.89 per cent of the total colleges. The strength of students is likely to follow the similar scenario. Almost all self-financed degree colleges are located in rural areas. Hence any initiative taken by the University or government to reduce rural-urban digital divide would need to strengthen self-financed institutions as well. Main findings of the study are highlighted in the following Box I.

Box I: Main Findings of the Study

- **Initiatives Taken by the University for Digital Student-University Interface are Appreciated by Majority of Students**
- **There is Need for Regular Faculty Upgradation Programmes to Motivate Them to use ICT led Teaching Methods**
- **Awareness Among Students is also Needed so That They can Appreciate and Make use of the ICT in a More Effective Manner**
- **Cyber-café on the Basis of Public-Private-Partnership Model may be Set Up in the Premises of Institutions**
- **Having a Compulsory Paper about Digital Technologies at the Graduation Level on the Lines of Environmental Paper is Expected to Help Students to Acquire More Knowledge**

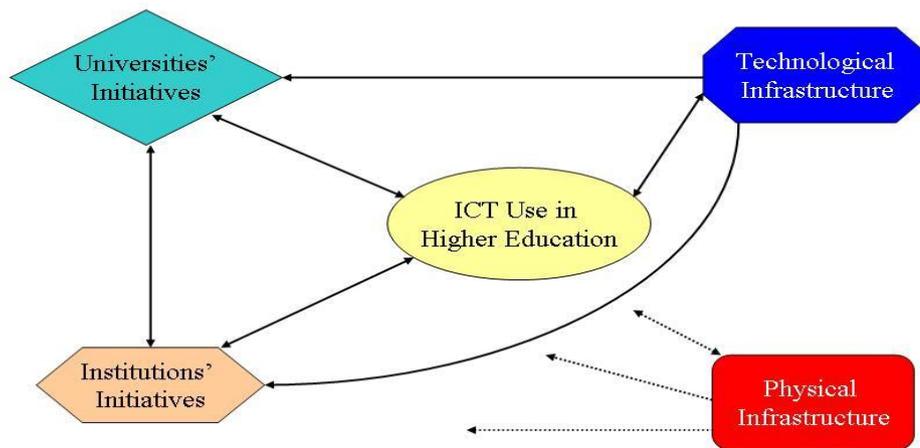
The remainder of the paper is as follows. Analytical framework is depicted in Section II while Section III presents data and statistical analysis. The findings are summarised in Section IV.

¹ The information has been collected from the website of Chatrapati Sahu Ji Maharaj University, Kanpur. It may be mentioned that there is only one engineering college in the district which is affiliated to Gautam Buddha Technical University and rest all are affiliated to CSJMU, Kanpur.

II. ANALYTICAL FRAMEWORK

Analytical framework used in the study is depicted in Figure 2. It can be seen from the figure that there are several stakeholders in the diffusion of ICT. While initiatives taken by the universities and higher education institutions are extremely important, the role of technological and physical infrastructure is even more important.

Figure 2: Analytical Framework



The causality among various stakeholders is shown by unidirectional and bidirectional arrows. Although lack of physical infrastructure influences all other stakeholders, it has not been discussed in great detail as it is beyond scope of the paper. Hence its link is shown with dotted lines. It is assumed that technological infrastructure which includes communication technologies influence both universities and academic institutions. Without efficient technological infrastructure, neither universities nor academic institutions can be effective in digital student-university interface. The link between use of ICT in higher education and technological infrastructure could be bidirectional because greater use of ICT could necessitate better technological infrastructure and vice versa is also true. Similarly, the association between the initiatives taken by universities and academic institutions could influence and be influenced by the use of ICT by students and faculty in higher education institutions.

The bidirectional link between universities and academic institutions suggest that initiatives taken by either institution affect the initiatives taken by the other.

The data are analysed within the framework depicted in Figure 2. However, due to lack of resources it has not been possible to include information from technological infrastructure providing agencies in the analysis. The sources of data and statistical analysis are presented in the following section.

III. DATA AND STATISTICAL ANALYSIS

The primary data for the study has been collected from four higher education institutions located in Sitapur district of Uttar Pradesh which has been selected as one of the six e-districts by the Government of Uttar Pradesh. These institutions are: Shri D. P. Verma Memorial Degree College, RMP Degree College, Sitapur Siksha Sansthan, and Institute of Engineering and Technology. Shri D. P. Verma Memorial Degree College falls in rural area of the district while others are located in urban areas. All other institutions, except RMP Degree College, are self-financed institutions. Except engineering college which is affiliated to Gautam Buddha Technical University, Uttar Pradesh, all other institutions are affiliated to Chatrapati Sahu Ji Maharaj University, Kanpur.

A set of 120 questionnaires were distributed to the students studying in various courses in these institutions. Out of the total, 72 completed questionnaires were received resulting into the response rate of roughly 58 per cent. The survey was conducted during October 2012 and January 2013. Before discussing statistical results and findings of the study, the profile of respondents is presented in Table 1.

Table 1: Profile of Respondents

Academic Information	Institution/ Course	Residence Type				Total No.	Chi-Square
		Rural		Urban			
		No.	%	No.	%		
Institutional Affiliation							0.00**
	SSS	2	28.6	5	71.4	7	
	IET			4	100.0	4	
	RMP	34	75.6	11	24.4	45	
	SDPVMDC	4	25.0	12	75.0	16	
Course Studying							0.061*
	BA	18	58.1	13	41.9	31	
	BBA			5	100.0	5	
	BSc	10	71.4	4	28.6	14	
	MA	9	69.2	4	30.8	13	
	MEd	2	33.3	4	66.7	6	
	MSc.	1	33.1	2	66.7	3	
Total		40	55.6	32	44.4	72	

Note: % → Row percentage;

** → 1 % level of significance; * → 10 % level of significance;

SSS → Sitapur Siksha Sansthan; IET → Institute of Engineering and Technology;

RMP → RMP Degree College;

SDPVMDC → Shri D. P. Verma Memorial Degree College

It can be seen from the table that largest percentage (62.5 per cent) of respondents comes from RMP Degree College followed by 22.2 per cent from Shri D.P. Verma Memorial Degree College. The minimum participation (5.56 per cent) is from engineering college. In terms of courses in which students were studying, largest percentage (43.06 per cent) comes from students who opted for Bachelor of Arts (BA) courses followed by Bachelor of Science (BSc) and Master of Arts (MA) courses 19.44 and 18.06 per cent respectively. The lowest percentage (4.17 per cent) of respondents was from Master of Science (MSc) programme. The table also shows that 55.6 per cent of students had rural background while 44.4 per cent belonged to urban areas. The association between institutional affiliation and background of students is highly statistically significant. The Chi-square statistics is significant at 1% level suggesting that institution that is located in rural area had the large percentage of students with rural background. The association of background of students with courses opted is also significant at 10% level. Hence it can be concluded that more students belonging to rural areas were doing non-technical courses such as BA and BSc while urban students preferred technical courses.

Table 2 presents the availability of technological infrastructure encompassing network technologies, Internet speed, and type of communication technologies.

Table 2: ICT Infrastructure in Institution

ICT Infrastructure		Residence Type				Total		Chi-Square
Components	Type/Speed	Rural		Urban		No.	%	
		No.	%	No.	%	No.	%	
Networks	Internet	29	72.5	27	84.4	56	77.8	0.228
	LAN	2	5.0	2	6.3	4	5.6	0.818
Internet speed	<= 100 M	21	52.5	8	25.0	29	40.3	0.008**
	101- 1,000 M	2	5.0	9	28.1	11	15.3	
	> 1 G							
Mode of Communication	Telephone	20	50.0	8	25.0	28	38.9	0.031*
	Dedicated line	2	5.0	1	3.1	3	4.2	0.692
	Wireless	4	10.0	18	56.3	22	3.6	0.000**
	VSAT ²			3	9.4	3	4.2	0.048*

Note: % → Percentage of respondents to the total in each category whose response of affirmative;

M→ Million Bits Per Second; G→ Giga Bits Per Second;

** → Significant at 1 % level; * → Significant at 5 % level

Internet and Local Area Network (LAN) are the only network technologies considered in the study as Wide Area Network (WAN) was not available in Sitapur district. The results presented in Table 2 suggest that availability of network technologies were not associated with the background of the students. This may be attributed to the fact that network technologies are accessible only in urban areas and students, irrespective of their background, had to use them in the district headquarters. However, Internet speed is highly statistically significant with the background of students. The cost of Internet use may be attributed to this phenomenon. The students from rural background might have preferred slow speed of Internet because of cost considerations. It may be mentioned here that high speed Internet is costlier.

Table 2 also presents interesting findings related to mode of communication for the Internet. More rural students preferred telephone based Internet connectivity while students with urban background preferred wireless connectivity. The results suggest that association between background of students and mode of communication is highly significant.

² VSAT (Very Small Aperture Terminal) is a satellite communication system

Enabling environment and availability of digitized information through Internet or Intranet are expected to encourage students to use more modern technologies. In this context, the data were collected from students about provision of digital communication with the affiliating Universities. Table 3 presents the awareness of students regarding digitized facilities provided by their Universities.

Table 3: Digital Communication Provision of the University

Digitized Activities	No.	Percentage
Student login	26	36.1
Examination form	51	70.8
Enrolment form	29	40.3
Results	52	72.2
Reading material	5	6.9
Lectures	3	4.2
Digital Library	53	73.6
Provision for communication with the university	5	6.9

It can be seen from Table 3 that large percentage of students is aware that examination form, enrolment form, digital library, and results are available on the website of respective universities. It may be worth mentioning here that Student Login facility has been provided by Chatrapati Shahu Ji Maharaj University from the academic year of 2010-11. Hence it is not surprising that merely 36.1 percent of students were aware of its existence on the website of the University. This facility is a major improvement in communication between student and the university. Although common e-mail communication with the University has been available to students for the last several years, Student Login provides individual communication with the University authorities. The login and password would remain valid for a student as long as he/she is student of the university irrespective of the course being persuaded.

Mere communication with the University is not the only activity where ICT can be useful. There are stand-alone activities where new technology can be used for improved learning. Here comes the use of ICT by faculty in higher education institutions. Table 4 presents the extent of ICT use by the faculty members of the sample institutions.

Table 4: ICT use by the Faculty for Teaching

Activities	No.	Percentage
Preparation of class notes	24	33.3
Preparation of literature	14	19.4
For better illustration of ideas	28	38.9
For better explanation of concepts	26	36.1

The results depicted in Table 4 present a very dismal picture in the context of use of ICT by faculty. Roughly one third of students feel that ICT were being used by faculty for the teaching activities such as, preparation of class notes, better illustration of ideas, and better explanation of concepts. Merely 19.4 percent of students feel that ICT were being used for preparation of literature related to their studies. In subsequent section the reason for lesser use of ICT by the faculty are explored. The results related to non-use of ICT are presented in Table 5.

Table 5: Reasons for not Using ICT by the Faculty

Activities	No.	Percentage
Lack of ICT infrastructure in the institution	22	30.6
Teachers are not aware of ICT led teaching tools	13	18.1
Lack of motivation	16	22.2
Lack of appreciation by students	11	15.3

The results presented in Table 5 suggest that lack of ICT infrastructure is considered the most important impediment in the use of ICT by faculty in these institutions. The second most important impediment is the lack of motivation of faculty. This is really an important finding of the study because it substantiates the argument of several scholars who argue that faculty upgradation programmes are very important for improving the teaching standards in the higher education. The lack of awareness of ICT led teaching tools and lack of appreciation by students are other two hindrances in the adoption of new teaching aids. Hence it can be inferred that the awareness programme related to ICT aided teaching might be useful for the students as well as faculty.

Teaching is not the only activity where ICT can benefit students. There are several non-teaching activities where it can be used by students. Table 6 presents the findings related to purpose of ICT use by students.

Table 6: Purpose of ICT use by Students

Purposes	Rural		Urban		Total		Chi - Square
	No.	%	No.	%	No.	%	
Downloading Examination form	12	30.0	20	62.5	32	44.4	0.006**
Downloading Enrolment form	5	12.5	9	28.1	14	19.4	0.096*
To get teachers' note on Pen drive/CD			8	25.0	8	11.1	0.001**
Results	23	57.5	19	59.4	42	58.3	0.873
Reading material	5	12.5	13	40.6	18	25.0	0.006**
Offline Lectures	2	5.0	3	9.4	5	6.9	0.468
Communication with the university	2	5.0	12	37.5	14	19.4	0.001**

Note: ** → 1 % level of significance; * → 10 % level of significance

Table 6 presents not only purpose of ICT use but also its association with the background of students. It is found that most common purpose of using Internet by the students cutting across the background is to see their course results. The second most important activity is to download or online submission of examination forms. There is huge variation in percentage of students who use ICT for filling examination forms in relation to their social background. Thirty percent of rural background students used ICT while more than double the percentage (62.5 percent) of urban background students preferred use of Internet in filling examination forms. It may be worth mentioning that usually first year examination forms are filled manually and subsequent years it is online submission in CSJMU. The association between filling of examination form and background of students is statistically very significant.

The third important activity for which ICT was being used by students is downloading reading material through Internet. The relationship between downloading of reading material through Internet and background of students is found to be highly significant (1% level of significance). Higher percent of urban background students (40.6 percent) were using ICT for downloading reading material while the percentage of rural background students was very low (12.5 percent). Same percentage (19.4 percent) of total students irrespective of their background used ICT for downloading enrolment form and communicating with the University. It can be seen from Table 6 that the percentage of urban background students that used ICT in these activities was higher than those who had rural background. The relationship is statistically significant. The results presented in Table 6 suggest that in general students with rural background are less prone to usage of ICT compared to students who had urban background. Easy accessibility of ICT and lack of awareness and knowledge of ICT to rural background students could be attributed to this phenomenon.

Having analysed the usage pattern of ICT by students, their opinion on the level of satisfaction is examined. The findings are presented in Table 7.

Table 7: Level of Satisfaction of ICT use

Activities	Satisfaction Level	Rural		Urban		Total		Chi-Square
		No.	%	No.	%	No.	%	
Are you satisfied with the digitized facilities provided by the university on its website?	S	25	62.5	21	65.6	46	63.9	0.052*
	NS	5	12.5	1	3.1	6	8.3	
	NE	1	2.5	6	18.8	7	9.7	
Are you satisfied with ICT facilities provided by the institution?	S	7	17.5	13	40.6	20	27.8	0.057*
	NS	22	55.0	10	31.3	32	44.4	
	NE	4	10.0	6	18.8	10	13.9	
Are you satisfied with the extent of ICT use by faculty?	S	15	37.5	10	31.3	25	34.7	0.570
	NS	14	35.0	16	50.0	30	41.7	
	NE	4	10.0	3	9.4	7	9.7	
Are you satisfied with ICT infrastructure?	S	5	11.3	14	42.3	19	25.2	0.018**
	NS	9	22.5	30	93.8	39	56.3	
	NE	2	5.0	7	21.9	9	12.6	

Note: S → Satisfied; NS → Not Satisfied; NE → Neutral

The results presented in Table 7 show that fairly large percentage of students (62.5 per cent of rural and 65.6 per cent of urban background) were satisfied with digitized facilities provided by the universities. On the other hand, 44.4 per cent of students were not satisfied with ICT infrastructure available in the institutions. Among non-satisfied students, larger percentage (55.0%), come from rural background. The association between level of satisfaction related to ICT infrastructure and background of students is statistically significant.

A close examination on the use of ICT by faculty suggests that majority of students were not satisfied with the extent of ICT used by the faculty for teaching. Irrespective of the background of students, 41.7 percent of students were of the view that ICT used by faculty is inadequate. It can be inferred from the findings that faculty needs to use more ICT led teaching tools for the benefit of students. Opinion of students on the availability of ICT infrastructure was also sought. The distribution of their opinion is presented in Table 7. It can be seen from the table that highest percentage (56.3

percent) of students were not satisfied with ICT infrastructure in the institutions. In fact majority (93.8 percent) of urban background students were dissatisfied with ICT infrastructure. The lower level of dissatisfaction among rural background students could be attributed to the lesser use of ICT by those students. The association between level of dissatisfaction regarding ICT infrastructure and background of students is highly significant (1% level).

The opinion of students was also sought on the possible initiatives that can increase the usage of ICT by students of higher education. The distribution of their opinion is presented in Table 8.

Table 8: Initiatives to Improve use of ICTs in Higher Education

Initiatives	No.	Percentage
Faculty needs to be motivated to use more ICT for teaching	44	61.1
Government should provide ICT infrastructure in the institution	39	54.2
Cyber-café should be set up in the premises on PPP model	46	63.9
There should be compulsory paper in ICT use for every student on the lines of environmental paper ³	52	72.2

It can be seen from the table that fairly large percentage (72.2%) of students was of the view that there needs to be a compulsory paper on the use of ICT on the lines of environmental paper which is expected to accelerate the learning momentum among students. The second initiative in the opinion of sample students was to setup cyber-café in the premises of institution based on Public-Private-Partnership (PPP) model. Roughly 64 per cent (63.9%) of students suggested setting up cyber-café on PPP model. More than sixty (61.1%) of students felt that faculty needs to be motivated for use of ICT led teaching methods. In other words students felt the need of regular faculty upgradation programmes that are prevalent in several universities in India and abroad.

³ It may be mentioned CSJMU has environmental paper that must be cleared by every student before awarding any degree by the university though marks obtained in the paper are not included in the pass percentage.

IV. SUMMARY AND CONCLUSION

The study aims at examining impact of Information and Communication Technologies (ICT) on higher education and to identifying major impediments that have resulted in slow penetration of ICT in higher education institutions in rural India. An attempt was also made to identify and analyse predicaments that hinder the diffusion of ICT in higher education institutions in rural areas. The paper is based on primary data collected from four higher education institutions located in Sitapur district, one of the six e-districts identified by the Government of Uttar Pradesh. The data from 72 students were collected through a semi-structure questionnaire. The survey was conducted during October 2012 and January 2013. Majority of the sample institutions were affiliated to Chatrapati Sahu Ji Maharaj University, Kanpur.

While praising the initiatives taken by the University for Digital Student-University Interface, findings of the study suggest that major impediment in the use of ICT in higher education institutions in rural areas has been the lack of ICT infrastructure. Most of the students were using digital technologies for downloading enrolment form, examination form, results and downloading reading material. The Students Login facility which has been provided by the University recently is a step forward in digital student-university communication. The findings suggest that there exists a digital divide among students of rural and urban background. Results also show that lack of awareness of faculty and lack of appreciation by students have also been reasons for lesser use of ICT led teaching methods by the faculty.

The study brings out empirical evidence to suggest that there is need for regular faculty upgradation programme and students also need to be educated about ICT led teaching tools. Based on the findings of the study it is recommended that cyber-café may be set up in the premises of higher education institutions so that student can make better use of their time and learn more about ICT. These cyber-café may be set up on Public-Private-Partnership (PPP) model. It is also recommended that there should be a compulsory paper at the graduation level on the use of ICT. This will ensure that any student passing out from the University is well aware of digital technologies.

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