NEW EDUCATION TECHNOLOGY IN TERTIARY EDUCATION IN INDIA: ADOPTION AND IMPEDIMENTS

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Abstract

The paper is based on a study that uses primary data collected from students of two private and two public universities located in the NCR. The survey was conducted during July-August, 2015. The Information on provision and use of New Education Technologies (NET), demographic information, factors affecting the use of new technologies, its impact, job preferences, and purpose of NET use were collected from 54 students of these universities. Findings of the study suggest that senior students (researchers) used NET more extensively. It also finds evidence of strong association between degree of NET use and job preference. The students whose preference is ICT related jobs used more advanced NET than those who were more inclined towards non-ICT related jobs such as legal, medical, accountancy etc. The NET use is found to be more prevalent in self-financed universities than the government aided ones. Two major impediments namely; insufficiency of e-class infrastructure and unreliability of new technologies emerged significant in differentiating students based on their level of NET use. The findings also support the argument that NET use impacts the students in several ways such as making them more confident and provides opportunity to interact with students of other institutions.

Keywords: NET, Tertiary education, ICT infrastructure, Job preference, Discriminant analysis

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1.   Introduction

Education plays a supreme role in the life of an individual. It is a very socially oriented activity and quality education has traditionally been associated with strong teachers having high degrees of personal contact with learners. In recent times teaching methodology has experienced tremendous change. New Education Technologies (NET) is expected to help both the teachers and students. Better quality of education is translated into human capital with skill commensurate with current industrial needs. The growing use of NET is changing and will likely continue to change many of the strategies employed by both teachers and students in the learning process. The use of NET in education lends itself to the content-centred curricula and competency-based curricula. This leads to more student-centred learning settings. But with the world moving rapidly into digital media and information, the role of NET in education is becoming more and more important and this importance will continue to grow and develop in this century. As students and teachers gain access to higher bandwidths, more direct forms of communication and access to sharable resources, the capability to support these quality learning settings will continue to grow (Oliver, 2013).

NET by their very nature are tools that encourage and support independent learning. Students using NET for learning purposes, become immersed in the process of learning and more and more students use computers as information sources and cognitive tools (Jonassen & Reeves, 1996). Learning approaches using NET provide many opportunities for constructive learning through their provision and support for resource-based, student-centred settings and by enabling learning to be related to context and to practice (Berge, 1998). Skills and knowledge are the driving forces of economic growth and social development for any country. The countries with higher and better levels of skills adjust more effectively to the challenges and opportunities. India is progressively moving towards a knowledge economy, due to the abundance of capable, flexible and qualified human capital. Thus, it has become increasingly important that the country should focus on advancement of skills that are relevant to the emerging economic environment. In order to further develop and empower the human capital to ensure global competitiveness, it is a necessity to impart quality education at the tertiary level. Although emphatic stress is laid on

education and training in our country, but still there is a shortage of skilled manpower to address the mounting needs and demands of the economy.

It is worth mentioning that pervasiveness of NET is very large. They can be applied in managerial functions in academic institutions or for knowledge acquisition and dissemination among the students. There has been rapid adoption of NET in Indian educational institutions, i.e., at school as well as tertiary levels. However, it is less known for what purpose these new technologies are being used by these institutions. Irrespective of the purpose of use of NET, a strong and reliable physical and technological infrastructure called knowledge infrastructure is essential for successful use of new technologies. Knowledge infrastructure has two components. First, that is with in control of the institution that intends to adopt NET and second, which is beyond the limit of individual institutions. Second part of the knowledge infrastructure encompasses a reliable communication network connecting national and international boundaries. The State is responsible to providing latest communication technologies which is beyond the scope of this paper.

The remainder of the paper is organized as follows: Section 2 contains review of literature while Section 3 describes the objectives and hypotheses of the study. The conceptual framework of the study is depicted in section 4 while the empirical results are presented and discussed in Section 5. The summary and conclusions have been drawn in Section 6.

2.   Review of Literature

Various studies have been carried out on the role of education towards economic development and human capital. Some of the relevant studies are discussed in this section.According to Oliver and Short (1996) adoption of ICTs into classrooms and learning settings have increased efficiency in terms of flexible program delivery. Another study by Oliver (2000) found that ICTs are able to provide strong support for teaching techniques as it provides world class settings for competency and performance-based curricula that make sound use of the these technologies. Another study by Young (2002) concludes that ICT has helped students' capability to undertake education anywhere, anytime and at any place. This flexibility has heightened the availability of just-in-time learning and provided learning opportunities for many more learners who previously

were constrained by other commitments. He also found that teachers appreciate mobile technologies and seamless communications and are able to be used to advantage for supporting 24x7 teaching and learning.

Deaney et.al (2003) found three major points for using ICT i.e. the need for wider skills for effective use of tools, the need to focus on the power of technology and the need to shift familiar patterns of classroom interaction by these technologies. On the other hand work-based learning is becoming popular with the integration of ICT in higher education. It advocates need-based learning and training, which is convenient and cost effective as it does not require travel (UNESCO, 2002). In order to face issues brought about by diversification, internationalisation and marketisation of higher education, it is necessary to innovatively integrate ICT in higher education (Hattangdi & Ghosh, 2008). Authors argue that this will ensure good quality, accessible and affordable higher education available to people in the developing countries.

Higher education plays a pivotal role in the economic and social growth of a country. Education increases the productive skills of individuals and also their earning power. It enables individuals to absorb new ideas, increase social interaction, gain access to improved health and many more tangible and intangible benefits (Kozma, 2005). Several studies (Glaeser and Maré, 2001; Wheeler, 2001; and Lal, 2005) provide evidence that the urban wage premium increases with education, suggesting that productivity effects are strongest for highly skilled workers. Another study by Morretti (2004) also shows education influences skill intensity. By using data on industry and college education rates, it shows that productivity is increasing in the share of city workforce that is college educated. In one of the studies by Lal and Paul (2013) found that firms that employed highly skilled workers performed better compared to others. Export oriented firms largely survive due to innovation and creativity that are effectively managed by their best workforce. Hence human resources are the most vital factor for firms' innovative activity.

Tertiary education in developing countries is serving as repositories of knowledge and human capital that will contribute to the economic development of the economies (Postiglione, 2009). The importance of human capital has been captured by several other studies such as (Lal, 2005; Siddharthan and Lal, 2004; Ducatel, 1998; and others). Lal's study finds that skilled human capital is needed not only in high-technology sector such as electronics but also in low-

technology sectors such as garments manufacturing. The present era of globalization is marked with adoption of ICT led technologies in every sphere of life. Hence it is considered important to analyze the institutions responsible for creating innovative human capital in India.

3.   Objectives and Hypothesis

The educational institutions in India have been experiencing Information and Communication Technology (ICT) led technical change for the last two decades or so. The educational institutions are adopting these new technologies at school and tertiary level so that students can understand the theoretical concepts in science and mathematics particularly rather than just reproducing the principles in exam without proper understanding. Technologies such as e-classrooms and Internet have potential to augment understanding of students easily. Several studies such as Maki (2008) and Lal and Shakya (2011) have investigated the extent of use of ICT in higher education system and found that it is used to a very limited extent. While earlier studies have focussed on use of few components of NET used, present study aimed at investigating use of NET (all possible forms of new technologies) and its impact on students. The main objectives of the study are –

   i. To identify type of NET used by the students
  ii. To investigate whether use of NET is influenced by the nature of the institution
 iii. To examine the nature of impact of NET use
 iv. To identify and analyse the impediments that influence the degree of NET use

3.1   Hypotheses

Digital technologies have potential to help students in improving their creativity and understanding more complex concepts easily. NET is expected to contribute not only in academics but also in social communication. However, the use of NET is not likely to be uniform across all section of students. Several personal and institutional factors are expected to have impact of use of NET among students. Based on the literature survey and in view of the objectives of the study, we formulate the following hypotheses:

Sample included in the study consists of students of under graduate course to research scholars pursuing M.Phil/Ph.D. Hence there is a variation of age of students. Although some forms of

digital technologies have been in existence in India for a long time, the obsolescence rate of NET is very high. Therefore younger generation students (UG students) are likely to be more familiar with the newest form of NET and might use such technologies extensively compared to students pursuing research. On the other hand senior students might use more advanced NET for their research work. Having no *a priory* knowledge of the nature of association between them, it is hypothesized that age may play an important role in influencing intensity of NET use.

H1: Age of a studentis likely to influence the degree of NET use

The second hypothesis is related to the job preference of students. During the survey it was noticed that students preferred a particular course keeping in mind their job preference. For instance students pursuing BCA course opted for computer and communication profession as their job preference. On the other had students pursuing law and accountancy were more inclined towards their profession. The relationship between preference of jobs and course pursuing is quite obvious. But it was considered important to relate job preference with the intensity of NET use. A study by Slechtova (2015) about students of the College of Polytechnics Jihlava pursuing technical course in the Czech Republic found that majority of the students indicated that there is an urgent need to be skilled in ICT field to succeed in the labour market nowadays. Based on the existing literature and field experience, it is hypothesized that students who were more inclined towards computer and communication related job used NET more extensively than the rest.

H2: The students who give more importance to ICT related jobs use NET more extensively

The fact that diffusion of NET has been very rapid among higher education institutions suggests that the new technology must be helping in their various activities. The question is that whether there is any visible impact on students who use NET from those who do not. Theoretically new technologies are like to contribute positively in their academic and social activities. A study by Azeiteiro et al. (2015) concluded that the surveyed bachelor, master, and doctorate students from Universidade Aberta, the Portuguese Distance Learning University, felt that they attained a high level of motivation and satisfaction, and had reached an effective learning outcome of knowledge, competences, values, attitudes and behaviour in environment and/or sustainability sciences by adopting digital technologies. Another study by Limbu and Markauskaite (2015) investigated university students and found that digital technology is a means to combine expertise to produce a good human capital by enabling the fusion of ideas and insights for a

deeper understanding of content and also to develop new skills and attitudes. In view of existing empirical evidence of the new technologies, it is expected that users of NET would realise impacts of digital technologies.

H3: The use of NET is expected to have noticeable impacts on students'

Fourth hypothesis deals with the provision of the new technologies with the institutions. Despite the tremendous benefits of NET, students of institutions would not get any benefit unless access to such technologies is ensured by the institution. Hence it is hypothesized that availability of new technologies is likely to influence the degree of use by NET.
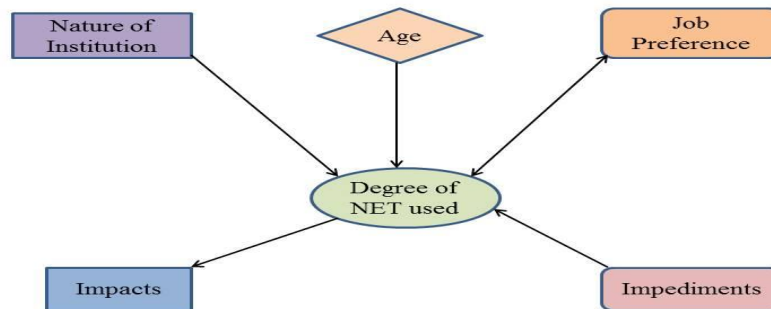
H4: Technological capacity of institutions is likely to influence the degree of adoption of NET by the students

Genesis for hypothesis four comes from the fact that reliability and availability of new technology is very critical. It is quite possible that many institution particularly privately managed might advertise for availability of latest educational technologies but may not be having it at all. Similarly in government institutions, technology may have been acquired but may not be operational. This may be possible due to archaic procedure of acquisition and implementation of new technologies in public institutions. An earlier study by Utulu (2008) in on three purposively-selected Nigerian private universities found that ICT and the Internet were readily available to academics in these universities.

4.   Conceptual Framework

The analytical framework used in the paper is depicted in Figure 1. It can be seen from the figure that extent of NET use is reinforced by several factors. The section discusses the association between use of NET and various factors associated with higher education.

Figure 1: Analytical Framework

The new education technologies have found a significant place in higher education. Its effective use has tremendous potential for enhancing outreach and improving the quality of education. However, there are several factors that reinforce the use of NET. For instance the age of an individual influences the usage of NET. The senior students are expected to use ICT more than the younger students as they need to use digital technologies for their day-to-day research activities. Also they are more acquainted with NET due to easy accessibility and reduced complexity of the new digital technologies.

The financial nature of the institution might influence the adoption of new technology as the private universities face severe competition from other such institutions and government universities. Hence they are expected to be up-to-date as far as the provision of digital technologies is concerned. They could easily do so as their decision making process is very simple compared to public owned institutions. The private institutions could attract students due to provision of state-of-the-art new technologies. Therefore it is assumed that students studying in private institutions are likely to have access to more advanced digital technologies. Consequently usage of NET by students studying in private institutions is expected to be more extensive.

The bidirectional arrow between job preference and the degree of NET use indicates both are interdependent as students who would prefer ICT job are likely to use NET extensively and extensive use of NET would enable them to get jobs in ICT sector easily. The association

between degree of NET use and impediments is depicted by unidirectional arrow suggesting that factors such as unreliable technology, insufficient infrastructure, lack of competent faculty etc. are likely to be the impediments in the use of NET by students. The use of NET is unlikely to change the impediments and hence the relationship is unidirectional. The NET usage is expected to have some impact on students. Those could be increased creativity, making them more confident, improved learning abilities, and provides opportunity to interact with students of other institutions. A unidirectional relationship between use on NET and its impact is assumed.

The bidirectional association between use of NET and other factors limits the analysis to application of discriminant technique and therefore any other econometric technique such as regression could not be used. Thus, the study uses the stepwise multivariate discriminant analysis to identify characteristics of students and universities that discriminate students by the degree of NET use. The discriminant analysis is used in cases where a random sample of observations, belonging to different groups (No NET users, Limited users of NET, Moderate users, Extensive users) in the present situation, is drawn and a procedure is set up (in terms of measured characteristics) to differentiate them and allocate each observation its respective group membership so as to minimize the probability of misclassification.

5.   Statistical Analysis

The findings of the study are based on survey of students from four higher education institutions, namely: i. ITM University, Gurgaon, ii. Ansal University, Gurgaon, iii. Gautam Buddha University, Greater NOIDA, iv. University of Delhi, Delhi. Out of these four institutions, the first two are private and the other two are public funded universities. The survey of these universities was conducted during July-August, 2015. The sample consists of 54 students.The results have been discussed at two levels – univariate and multivariate analysis.

5.1 Univariate Analysis

Apart from personal information, details of NET used by the students and impact on them were collected through a semi-structured questionnaire. The information on impediments of using NET was also gathered. With regard to gender distribution of students, 55.6 per cent are males while 44.4 per cent are females. Majority (55.6 per cent) of students fall in the age group of 21-23 years while same percentage (22.2 per cent) is of 18-20 and 24+ years. As far as distribution

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of students by their study stream is concerned, 42.6 per cent belong to engineering, 22.2 per cent are research scholars (M. Phil or Ph. D). The percentage of students pursuing management courses are 18.5 per cent while 14.8 per cent belong to science stream and only one student is pursuing law course. Majority of the students (96.3 per cent) are studying on a full time basis.

Information on access to NET (personal and institutional) was also collected. Their responses are presented in Table 1.

Table 1: Accessibility of NET

Type of Technology	Personal (%)	Institutional (%)
Standalone desktop	-	-
Desktop with internet	18.5	81.5
Standalone laptop	1.9	1.9
Laptop with internet	87.0	16.7
Tablet/iPad	14.8	-
E-reader	13.0	1.9

The information about the ownership of technological tool was sought. The table indicates that a very high percentage (87 per cent) had their own laptop with Internet facility. It can also be seen from Table 1 that 18.5 per cent had access to desktop with Internet in their homes. A fairly good percentage of respondents 14.8 and 13.0 per cent owned tablet and e-reader respectively. As far as the provision of NET by institutions is concerned, the highest percentage (81.5 per cent) reported that desktop with internet was made available by their institution. This is quite obvious because as the institutional labs are equipped with desktop with internet. It was found during the survey that students studying in post-graduate programs (Engineering and Management) were also provided laptops with Internet. The percentage of students who shared this view is 16.7 per cent. The table also indicates that standalone laptops are no more a preferred choice which is quite obvious as Internet is now an integral part of laptops. The provision of tablets and e-readers are not a viable option for institutions.

On the question of the use of network technologies, the responses are presented in Table 2.
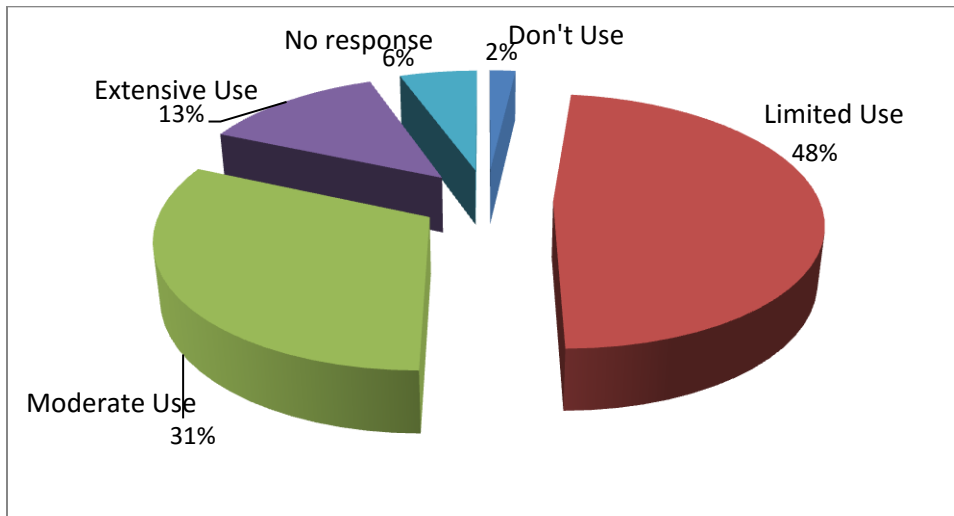
Table 2: Accessibility of network technologies

Type of Technology	Yes (%)	No (%)	DNK(%)
Intranet	47 (87.0)	7(13.0)	-
Wi-fi	44(81.5)	10(18.5)	-
Cloud Computing	9(16.7)	37(68.5)	8(14.8)

The table indicates that 87.0 per cent of the respondents opined that intranet is available in their institution while 81.5 per cent reported that their campus is Wi-Fi enabled. A surprising finding is that 14.8 per cent of the respondents did not know what the cloud computing is. Majority (68.5 percent) of them reported that the cloud computing facility is not available in the institution. A small percentage (16.7 per cent) claimed that the facility is available. All the respondents who reported availability of cloud computing belonged to Engineering faculty and cloud computing may be part of their course curriculum. As far as the speed of Internet provided by the institution is concerned, majority (75.9 per cent) of the respondents opined that it is < 100 mbps while 13.0 per cent respondents indicated the speed to be between 100 mbps and <1 gbps. A small percentage of respondents (11.1 per cent) claimed the speed of Internet in their institution is >1 gbps.

The responses for the extent of use of NET are reported in Figure2.
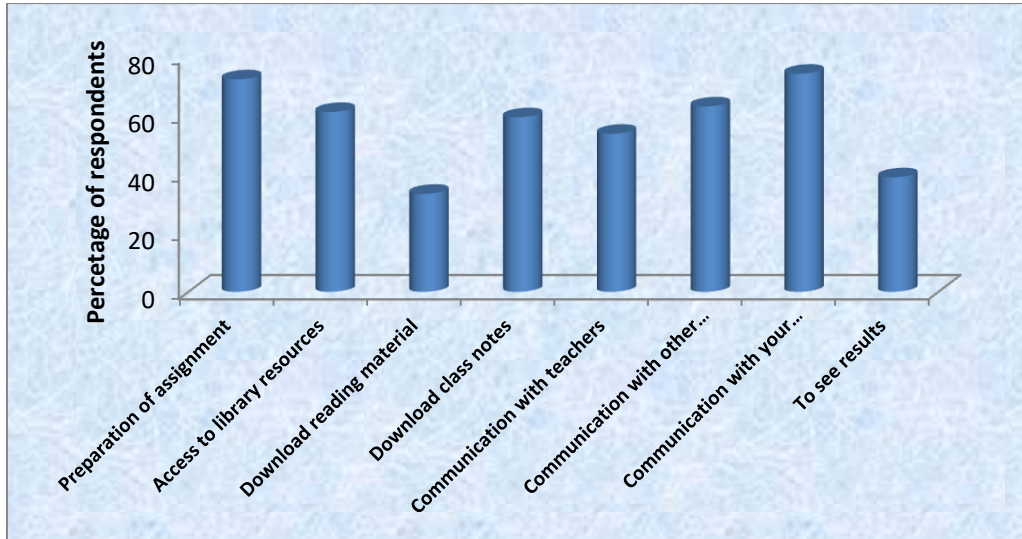
Figure 2: Extent of use of NET

The figure shows that almost fifty per cent (48.1 per cent) of respondents used NET to a limited extent while just 13 per cent are found to be the extensive users of the new technologies. The

percentage of moderate users of NET is 31.5 per cent. Three respondents did not prefer to answer this question.

Figure 3 presents the analysis of purpose of NET use. The various purposes can be grouped into two categories, namely: academic and managerial.

Figure 3: Purpose of use of NET

It can be seen from the figure that among the academic activities, 72.2 per cent responded that they use digital technologies for preparation of assignments. This is followed by access to library resources were the response rate is 61.1 per cent. Surprisingly only one third of the respondents used the new technologies for downloading reading material. As far as the managerial activities are concerned, highest (74.1 per cent) response rate was for communication with their college/university.The figure also suggests merely 38.9 per cent of students use NET for viewing results which is very surprising. One of the reasons for this behavior could be that few students see the result on the site and communicate that to others using different means of communication. This is substantiated by the fact that 63.0 per cent of the students use digital technologies to communicate with others students.

The impact of new technologies was measured on a five point scale, namely; 1 'strongly disagree', 2 'disagree', 3 'neutral', 4 'agree', 5 'strongly agree'. The average scores are presented in Table 3.

Table 3: Impact of new technology use

Aspects	Score					Average score
	1	2	3	4	5	
Better understanding of complex concepts	1 (1.9)	5 (9.3)	16 (29.6)	24 (44.4)	4 (7.4)	3.50
Better communication with faculty	-	4 (7.4)	25 (46.3)	19 (35.2)	2 (3.7)	3.38
Better communication and collaboration with class mates	2 (3.7)	2 (3.7)	17 (31.5)	22 (40.7)	7 (13.0)	3.60
Skill development			23 (42.6)	24 (44.4)	6 (11.1)	3.68
Helped in prompt feedback from the faculty	1 (1.9)	11 (20.4)	16 (29.6)	15 (27.8)	6 (11.1)	3.29
Provided more opportunities for practice and reinforcement	1 (1.9)	6 (11.1)	21 (38.9)	15 (27.8)	7 (13.0)	3.42
More likely to focus on real-world tasks	2 (3.7)	5 (9.3)	13 (24.1)	22 (40.7)	7 (13.0)	3.55
Allows greater control of class activities	-	5 (9.3)	19 (35.2)	14 (25.9)	9 (16.7)	3.57

Note: Figures in parenthesis are percentage to total respondents

It can be seen from the table that skill development has acquired the highest score. This is followed by 'better communication and collaboration with class mates' and 'allows greater control of class activities'. It is evident from the table that the impact on students' has been very positive with improvement in their communication, skill development and better control of their activities.

The barriers of NET usage are depicted in Table 4.

Table 4: Barriers for using e-class

Aspects	Average score	Ranking
Not very relevant	2.10	6
Do not have necessary skills	2.26	4
Do not have technical support needed	2.32	3
E-class infra is insufficient	2.20	5
E-classes are not very effective	2.36	2
Technology is not very reliable	2.37	1

Note: Opinions were collected on a four point scale- 1 'major barrier', 2 'To some extent', 3 'Moderate', 4 'Not at all'.

The table indicates that non-reliable technology and ineffective e-classes are considered the major barriers by the students. This is followed by non-availability of technical support and lacking necessary skills.

5.2 Multivariate Analysis

The data on various job preferences were collected. From analysis point of view, preferences are grouped into two categories, namely; ICT related and others. ICT related jobs include computer and communication related profession while other category encompass accountancy, tour and travel, hospitality, medical, journalism, and educational etc. As far as the data on degree of NET use is concerned, it was collected on a four point scale, namely; 'No NET use', 'Limited use', 'Moderate use', 'Extensive use'. The association between job preference and extent on NET use is presented in Table 5.

Table 5: Degree of NET used and job preference

| Degree of NET used | Job preference | | | | Total | |
| | ICT related | | Others | | | |
	No	Row %	No	Row %	No	Col. %
No use	-	-	4	100.0	4	7.4
Limited	14	53.8	12	46.2	26	48.1
Moderate	10	58.8	7	41.2	17	31.5
Extensive	6	85.7	1	14.3	7	13.0
Total	30	55.6	24	44.4	54	100.0

Note: Chi-square: 7.683, Level of Sig.: 0.052

Table 5 shows that there is positive association between degree of NET use and job preference. This is substantiated by the fact that 53.8 per cent of students who preferred ICT related jobs used NET to a limited extent while 85.7 per cent are extensive users of NET having same job preference. On the other hand, among students whose job preference is other than ICT, a very high percentage (46.2 per cent) used NET to a limited extent whereas percentage of students with same job preference and extensive users of NET was just 14.3 per cent. Hence it may be inferred that ICT related job seeking students used NET more extensively than others. Chi-square test suggests that the association is significant at the level of 10 per cent.

Table 6 presents the distribution of students by their age and degree of NET use. The age was measured on a three point scale, i.e., 1 '18-20', 2 '21-23', and 3 '24+'. The relationship seems to

be an inverted U shape. In limited use of NET category, 23.1 per cent belong to age group of 18-20 while 65.4 per cent belong to age group of 21-23 years and 11.5 per cent are from the 24+ age group.

Table 6: Degree of NET used and age of students

Degree of NET used	Age						Total	
	18-20		21-23		24+			
	No	Row %	No	Row %	No	Row %	No	Col. %
No use			1	25.0	3	75.0	4	7.4
Limited	6	23.1	17	65.4	3	11.5	26	48.1
Moderate	5	29.4	8	47.1	4	23.5	17	31.5
Extensive	1	14.3	4	57.1	2	28.6	7	13.0
Total	12	22.2	30	55.6	12	22.2	54	100.0

Note: Chi-square: 9.329, Sig.: 0.156

In the category of moderate users of NET, the association is flatter than category of extensive users. Almost 50 per cent (47.1 per cent) belong to age group of 21-23. In extensive category of NET users also 57.1 per cent belong to age group of 21-23. It can be seen from the table that there is a uniform trend in all categories of NET users. The table also shows that the percentage of students (24+ years) increases with intensity of NET use. Based on the results, it may be inferred that senior students use NET more extensively. However, the association is statistically insignificant (Sig.: 0.156).

Out of the four institutions surveyed, two are owned by the government and other two are of self-financed nature. Among government owned institutions, University of Delhi is under central government while Gautam Buddha University falls under jurisdiction of State government of Uttar Pradesh. The distribution of students by intensity of NET use and nature of financial support is presented in Table 7

Table 7: Degree of NET used and financial status of the institution

Degree of NET used	Financial status				Total	
	Self-financed		Public funded			
	No	Col %	No	Col %	No	Col. %
No use	-	-	4	100.0	4	7.4
Limited	9	45.00	17	50.00	26	48.1
Moderate	8	40.00	9	26.47	17	31.5
Extensive	3	15.00	4	11.76	7	13.0
Total	20	100.00	34	100.00	54	100.0

Note: Chi-square: 3.252, Sig.: 0.354

It can be seen from the table that trend of NET use in both types of universities is similar. The largest percentage (45.00 per cent in Self-financed and 50 per cent in public funded universities) of students belong to category of students who used NET to a limited extent while lowest percentage of students were users of NET extensively in both types of universities. It was expected that self-financed universities might be better equipped with latest digital technologies as they face stiff competition in attracting students. Consequently students studying in these universities are expected to use NET more extensively. It is true to some extent as 15.00 per cent of self-financed and 11.76 per cent of government owned universities used NET more extensively but the relationship is statistically insignificant.

Out of several impacts of NET use such as 'Helped in understanding concepts more clearly', 'Better illustration of ideas', 'Increased creativity', 'Better job prospects', 'Makes more confident', 'Helped in personality development', 'Improves my learning abilities', 'Provides opportunity to interact with students of other institutions effectively', 'Equated with international teaching methodologies', 'Convenience', and 'Helped in managing my class activities (e.g. planning, apportioning time etc.)' only 'Makes more confident' and 'Provides opportunity to interact with students of other institutions effectively' emerged significant as far as their association with use of NET is concerned. The analysis of impact-1 is presented in Table 8.

Table 8: Degree of NET used and its impact-1

| Degree of NET used | Use of NET makes more confident | | | | | | | | Total | |
| | Not useful | | Neutral | | Useful | | Very useful | | | |
	No	Row %	No	Row %	No	Row %	No	Row %	No	Col. %
No use					2	66.7	1	33.3	3	6.4
Limited	5	23.8	8	38.1	7	33.3	1	4.8	21	44.7
Moderate			3	18.8	9	56.3	4	25.0	16	34.0
Extensive			2	28.6	2	28.6	3	42.9	7	14.9
Total	5	10.6	13	27.7	20	42.6	9	19.1	47	100.0

Note: Chi-square: 15.091, Sig.: 0.088

Table 8 shows that among the category of limited users 33.3 per cent of students opined that use of NET 'in making them confident' is useful while merely 4.8 per cent opined that it is very useful. On the other hand in category of extensive users of NET, the scenario is just reversed. Close to 43 (42.9) per cent are of the view that it is very useful while just 28.6 per cent reported that it is useful. Statistically the association between intensity of NET use and opinion on making them confident by using it is significant at 10 per cent level.

The analysis of another impact of NET use, i.e., 'It provides opportunity to interact with students of other institutions effectively' is presented in Table 9.

Table 9: Degree of NET used and its impact-2

Degree of NET used	Use of NET Provides opportunity to interact with students of other institutions effectively								Total	
	Not useful		Neutral		Useful		Very useful			
	No	Row %	No	Row %	No	Row %	No	Row %	No	Col. %
No use					1	33.3	2	66.7	3	6.3
Limited	6	27.3	11	50.0	4	18.2	1	4.5	22	45.8
Moderate	5	31.3	3	18.8	6	37.5	2	12.5	16	33.3
Extensive			2	28.6	4	57.1	1	14.3	7	14.6
Total	11	22.9	16	33.3	15	31.3	6	12.5	48	100.0

Note: Chi-square: 17.942, Sig.: 0.036

It can be seen from the table that more than half of the student (56.2 per cent) were either neutral or did not find it useful as far as ease of communication with other students is concerned. A very small percentage (12.5 per cent) finds it very useful while 31.3 per cent opined as merely useful. Table 9 also shows that there is an increasing trend of students by NET use in very useful category. For instance among limited users of NET, merely 4.5 per cent opined that use of NET is very useful in communication while 14.3 per cent of extensive NET users expressed the same opinion. Similar trend is being followed in useful category. Therefore it may be inferred that intensity of NET use and its ability to improve communication is positively associated. The relationship is statistically significant at 5 per cent level.

Identifying impediments of NET use is one of the objectives of the study. The study included all possible impediments such as, 'Don't have necessary skills', 'Don't have technical support needed', 'E-class infra is insufficient', 'E-classes are not very effective', and 'Technology is not very reliable'. Two impediments namely; 'E-class infra is insufficient' and 'Technology is not very reliable' emerged significant in discriminating various groups of students. Table 10 presents the distribution of their opinion on first impediment.

Table 10: Impediments in use of NET -1

Degree of NET used	E-class infrastructure is insufficient								Total	
	Major barrier		To some extent		Moderate		Not at all			
	No	Row %	No	Row %	No	Row %	No	Row %	No	Col. %
No use	3	100.0							3	6.5
Limited	14	63.6	1	4.5	6	27.3	1	4.5	22	47.8
Moderate	3	21.4	2	14.3	2	14.3	7	50.0	14	30.4
Extensive	1	14.3	3	42.9			3	42.9	7	15.2
Total	21	45.7	6	13.0	8	17.4	11	23.9	46	100.0

Note: Chi-square: 25.459, Sig.: 0.003

It can be seen from Table 10 that in total 45.7 per cent of students opined that E-class infrastructure is insufficient. Among students who thought this is a major barrier, 63.6 per cent are limited users of NET and 14.3 per cent are extensive users of NET. Limited use of NET by such a large percentage of students might be due to this reason. On the other hand among extensive users of NET, 42.9 per cent are of the opinion that insufficiency of infrastructure is true to some extent and same percentage opined that this is not a constraint at all. Among all the students surveyed, the percentage of students who did not consider infrastructure as an impediment is 23.9 per cent. The association is statistically significant at the highest level, i.e. 1 per cent. It may be inferred from the results that students who considered E-class infrastructure is insufficient, used NET to a limited extent and those who did not consider so are extensive users of NET.

The reliability of technology is considered another constraint in the use of NET. The distribution of students' opinion is presented in Table 11.

Table 11: Impediments in use of NET -2

Degree of NET used	Technology is not very reliable								Total	
	Major barrier		To some extent		Moderate		Not at all			
	No	Row %	No	Row %	No	Row %	No	Row %	No	Col. %
No use	3	100.0							3	6.5
Limited	13	59.1			6	27.3	3	13.6	22	47.8
Moderate	3	21.4			2	14.3	9	64.3	14	30.4
Extensive	2	28.6	1	14.3	2	28.6	2	28.6	7	15.2
Total	21	45.7	1	2.2	10	21.7	14	30.4	46	100.0

Note: Chi-square: 20.332, Sig.: 0.016

Table 11 shows that opinion of students on this constraint is similar to that of first impediment. Among those who considered unreliability as major factor, 59.1 per cent falls in the category of

limited users of NET while 28.6 per cent of extensive users of NET expressed the same opinion. In total 47.9 per cent of the respondents are of the opinion that either it is a major or to some extent barrier. It can also be seen from the table that trend of opinion as a major barrier by various levels of NET use is just reverse than those who opined that it is moderate or not all a barrier. Therefore it may be inferred that larger percentage of moderate and extensive users of NET considered technology is reliable. The association between degree of NET use and reliability of technology is positively associated at 5 per cent level of significance.

Subsequently the data were subjected to a multivariate test called discriminant analysis to identify factors that discriminated students on the basis of degree of NET use. The findings of discriminant analysis are presented in Table 12.

Table 12: Discriminant Analysis

Variables	Mean by NET user group				Wilk's Lambda	F-Stat.	Level of Sig.	Description of variables
	I	II	III	IV				
Job	2.00	1.48	1.29	1.14	.829	2.821	.051	Job preference of student
Impact-1	3.33	2.19	3.00	3.14	.743	4.718	.006	Makes more confident
Impact-2	3.67	2.00	2.21	2.86	.776	3.938	.015	Provides opportunity to interact with students of other institutions effectively
Impd-1	1.00	1.76	2.93	2.71	.748	4.614	.007	E-class infrastructure is insufficient
Impd-2	1.00	2.00	3.21	2.57	.762	4.261	.010	Technology is not very reliable
Age	3.00	1.95	2.07	2.14	.852	2.373	.084	Age of student
Inst_type	2.00	1.67	1.50	1.57	.934	.964	.419	Financial nature of institution

The results presented in Table 12 shows that all the variables except financial nature of the institution, included in the analysis emerged significant in discriminating four groups of students. It was found in the bivariate test on page 14 that percentage of students is higher in self-financed universities in the category of moderate and extensive users of NET. The variable has not emerged significant as trend followed with respect to degree of NET use is similar in both types of institutions. Hence the hypothesis IV that the use of NET is different in self-finance and government owned institutions holds true. As discussed earlier that self-financed institutions provide access to state-of-the-art technology due to easier decision making process and intense

competition to attract students. Consequently students studying in such institutions get an opportunity to use NET more extensively than others.

Table 12 shows that the age has significantly discriminated students of four groups. The level of significance is 10 per cent. It seems that the senior students who are pursuing research (M.Phil or Ph.D) used NET extensively compared to others who are pursuing UG or PG. The results are not surprising as the use of extensive NET is imperative for senior students. They have to not only use NET for accessing the latest research papers but also to access databases that are necessary for their research work. The senior students need to interact more frequently with their supervisors and other researchers working on similar topics. Hence senior students might be using NET more extensively than others. The findings substantiate the first hypothesis of the study.

The preference of job has also emerged as one of the discriminants of the degree of NET use. The finding is not only according to our expectation but also quite obvious. Students who are inclined towards technology oriented jobs would try to learn and use digital technologies as much as possible so that they can use the knowledge that they acquired during studies while searching for jobs. Hence the second hypothesis holds true.

The findings of the study suggest that there are two impacts, i.e., use of NET 'makes them more confident' and 'provides opportunity to interact with students of other institutions effectively' emerged significant in discriminating four groups of students. Their level of significance is 5 and 10 per cent respectively. The emergence of these factors is according to our expectation. The use of NET enables them to integrate not only with other students but also with society in general. It enables them to share lot of commonality and consequently makes them more confident. On the other, those who either do not use NET or use to a limited extent feel isolated from these students and society resulting in being less confident. The discriminatory nature of second impact is also according to our expectation and very obvious. The students who use new technologies such as email with drop box facility and access resources through file transfer protocol can communicate with other students and teachers more effectively. The NET provides them opportunity to interact through any-where, any-one, and any-time mode.

The study finds two major impediments that significantly discriminated students based on the degree of NET use. These are: E-class infrastructure is insufficient and Technology is not very reliable. It is considered important to clarify that opinion of students was sought on E-class infrastructure and reliability of technology and it is being related to the use of NET which includes other technologies than E-class. The level of significance of these factors is highest i.e. 1 per cent. The findings are on the expected lines. Results presented on pages 16 and 17 suggest more percentage of students who are extensive users of NET did not find E-class infrastructure insufficient and also considered the new technology very reliable. On the other hand students with limited users of NET cited these problems. This may be due to the fact that such students are not inclined towards NET but blamed to insufficiency and unreliability of E-class technologies.

Based on the discriminant function used in the analysis, the students are regrouped into predicted membership. The results are presented in Table 13.

Table 13: Classification results

Original group membership	Predicted group membership				
	No use of NET	Limited	Moderate	Extensive	Total
No use of NET	3 (100.0)				3
Limited		15 (71.4)	3	3	21
Moderate		3	8 (57.1)	3	14
Extensive		2	1	4 (57.1)	7

Note: Classification power of the function: 66.7 per cent;
Figures in parenthesis are correctly classified respondents

It can be seen from the classification table that all three non-users students and 71.4 per cent of limited users of NET have been correctly classified. The percentage of such students who are either moderate or extensive users of NET is 57.1 per cent. The overall classification power of the discriminant function is 66.7 per cent which is more than fifty per cent and considered as being within permissible limit. It can be inferred that the factors used in the study are not the only factors that influence the degree of NET use.

6.   Summary and Conclusions

The study is based upon primary survey of four higher education institution in NCR namely: ITM University and Ansal University, Gurgaon,Gautam Buddha University, Greater NOIDA and

University of Delhi.The institutions in Greater NOIDA and Delhi are public funded while the rest are self-financed in nature. The survey of 54 students from all these institutions was conducted during July-August 2015. A semi-structured questionnaire was used to collect the data from the students. Apart from their demographic details, questions about NET usage by the students and impact on them were collected.

The entire sample of students was grouped into four categories based on the degree of NET used by them. They are: 1 'No NET use', 2 'Limited use', 3 'Moderate use', 4 'Extensive use'. The findings suggest that age of students played a significant role in discriminating four groups of students. The senior students (pursuing M.Phil or Ph.D) used NET more extensively than others. The finding is in accordance with our expectation as the research students need to use more extensive NET for accessing databases and latest research articles etc. They also need to have intense interaction with their supervisor and other scholars working in the similar areas.

The preference of job also emerged as an important discriminant of degree of NET use. The opinion of students about their job preference indicates high association between the extent of NET use and ICT related job preference. The finding is not only in accordance with our expectation but also quite obvious. Students who are inclined towards technology oriented jobs would try to learn and use digital technologies as much as possible so that they can use the knowledge that they acquire during studies while searching for jobs. It is also true that the degree of use of digital technologies and job preference is inter dependent as students preferring ICT related jobs use technology extensively.

The findings of the study suggest that there are two impacts, i.e., use of NET makes them more confident and provides opportunity to interact with students of other institutions effectively emerged significant in discriminating four groups of students. The emergence of these factors is according to our expectation. The use of NET enables them to integrate with not only other students but also with society in general. It enables them to share lot of commonality and consequently makes them more confident. The discriminatory nature of second impact is also according to our expectation and very obvious. Students who use new technologies such as email with drop box facility and access resources through file transfer protocol can communicate with

other students and teachers more effectively. The NET provides them opportunity to interact through any-where, any-one, and any-time mode.

The study finds two major impediments that significantly discriminated students based on the degree of NET use. These are: E-class infrastructure is insufficient and Technology is not very reliable. The findings are on the expected lines. The results suggest that more percentage of students who are extensive users of NET did not find E-class infrastructure insufficient and also considered the new technology very reliable. On the other hand, students of limited users of NET cited these problems. This may be due to the fact that such students are not inclined towards NET but blamed to insufficiency and unreliability of E-class technologies.

It is found that the percentage of students is higher in self-financed universities in the category of moderate and extensive users of NET suggesting that self-financed institutions provide and encourage use of NET more than government institutions. Hence the hypothesis IV that the use of NET is different in self-finance and government owned institutions holds true. As discussed earlier that self-financed institutions provide access to the state-of-the-art technology due to easier decision making process and intense competition to attract students. Consequently students studying in such institutions get an opportunity to use NET more extensively than others.

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