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Information and Communication Technologies (ICT) and university freshmen

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Abstract

Young people who grow up with the Internet are called the Net generation and they might be more impressively technologically literate, more accepting new technology and more technically facile than the former generations. The Net generation is very fluent with ICTs to participate and meet the demands of the 21st century. In this context, this study is an attempt to see the level of ICT literacy of new entrant undergraduates to Sri Lankan universities by examining their usage of digital technologies and communication tools, self rated skill levels on digital technology related activities and finally their perceptions of the impact of ICT on academic work in the universities. The study is compiled with data from questionnaires, placed with 1601 first year students, in thirteen universities of Sri Lanka. Questionnaire for the study was designed to gather data in three major areas; background Information, access to ICT and perceptions on the impact of ICT on academic experience. The data collected from the questionnaire was analyzed using the Minitab® Release 14.1 and the SPSS (Statistical Package for Social Scientists) 13.0 for windows, occupying a variety of statistical techniques. Descriptive statistics was used to produce statistics for each variable or for subsets within a variable. Chi-square test, Kruskal-Wallis one-way analysis of variance test and Friedman test were employed was occupied to reach the objectives of the study. The results reveal that there is a rapid trend towards becoming university freshmen as much as be digital literate. Most of the first year students use the computer applications and have indicated that they are much more skillful with them. Results also reveal that ICT usage frequencies and the self rated skills of ICTs are greater for the male students than females. First years who belong to urban communities believe that they are more skillful and use ICT more frequently. ICT skills and usage amongst students of the Arts streams are somewhat lower than the rest. The majority of freshmen believe that using ICTs is likely to help them to improve their learning in the university and are willing to use ICTs to search for information for academic purposes. They wish to have more access to Internet/E-mail facilities and ICT related equipment such as laptop computers, pen drives. It is recommended that more

facilities and ICT related training are provided for freshmen, and at the village level literacy is improved by providing more facilities.

Keywords: *ICT literacy, digital technology skills, use of ICT*

Introduction

Information and Communication Technology (ICT), is a term synonymously used with Information Technology (IT) (Agbonlahor, Bamitale & Okike, 2003). According to Blurton (1999), ICT is defined as a "diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information".

ICT literacy is the ability to use digital technology, communication tools and networks appropriately to deal with information related issues of the knowledge society. This includes the ability to use technology as a tool to research, organize, evaluate and communicate information, and the possession of a fundamental understanding of the ethical/ legal issues surrounding the access and use of information. Therefore, ICT literacy levels among students, is an indication of the future success of these students.

As Prensky argued in his paper in 2001, every new group of students coming into the universities is fundamentally different from any that educators had seen before. He called this new generation of students as 'digital natives'. Digital natives have spent their entire lives surrounded by computers, video games, digital music players, video cams, cell phones, and all other toys and tools of the digital age (Prensky, 2001a).

Today, most of the students entering universities have grown up with computers, software applications, Internet access, and communication tools. Recent surveys show that word processing, for instance is second nature to these students in the sense that most of them report having learned it at home with family support (Hoffman and Vance, 2005).

The use of ICT is pervasive throughout the university curriculum in Sri Lanka now. The University of Colombo, School of Computing (UCSC) had conducted a study in 2009 to measure the IT proficiency of undergraduates in higher education institutions in Sri Lanka. They had carried out an IT proficiency test to evaluate the IT knowledge and skill of undergraduates. Despite today's ICT conducive background the study has revealed that the skill level of the students is at a minimum required level, and that they do not possess the professional level competency required in the job market. Since the modern workplace requires ICT-literate knowledge workers, it is imperative that students attain the skills required in order to succeed in the job market.

More importantly, they need a certain level of ICT to perform their academic work while at the universities. Knowledge of ICT skills at the basic level may render incoming freshmen unable to perform the fundamental tasks required at the university level. The present day Sri Lankan undergraduates recognize the need and the benefits of various novel technologies and are willing to learn and adopt them. They in fact request for more facilities to be provided for this purpose and are willing to undergo the necessary training to learn these technologies.

In-depth studies that investigate the current situation are very much needed to propose the guideline to produce the ICT literate graduate output. However, the number of studies in this area is very limited in Sri Lanka.

This study aim at gathering information on the use of digital technologies and communication tools by freshmen, their current levels of skill, and examine their perceptions and appreciations about the impact of ICT on their academic work.

Methodology

The study was designed to examine the perceived ICT literacy of first year undergraduate students in Sri Lanka. To explore the underlying usage of ICT, a comprehensive survey was carried out. 'Survey' is a method used to conduct a very wide range of potential research (Wilson, 2000).

Population of the study was the students enrolled for the 2008/2009 academic year in Sri Lankan universities. The total was 17864 first year students following subject streams in Science, Medicine, Engineering, Management, and Arts.

Stratified random sampling technique was used for the study, in order to represent all the categories of the population. 'University' was identified as the criteria for the stratification. Proportionate random sample from universities was drawn by using the Yamane's simplified formula. The selected sample comprised of 1788 first year students.

'Questionnaire' was selected as the 'research instrument' for this study and it was designed to gather data in four major areas. First background information such as university, faculty, age, gender, ethnicity, community and information on computer courses followed was collected. Under the area of 'access to ICT', information was gathered about the locations where ICT was accessed and the level of access to some popular ICTs. 22 different applications of ICTs were included under the area of 'Use of ICT' to examine the frequency of using ICT and the perceived skill level of students. Finally the perceptions on the impact of ICT on academic experience were considered. Six scenarios, learning, course activities, results, skills, academic quality, and communication were given under this section in order to find out their perceptions on the impact of ICT on their academic activities in the university. Open ended questions were asked on ways in which they thought the ICTs that they used in their everyday lives could be useful in their studies at the university and if they wished to have more ICT facilities at the university in future.

The data collected from the questionnaire was analyzed using the Minitab® Release 14.1 and the SPSS (Statistical Package for Social Scientists) 13.0 for windows occupying a variety of statistical techniques. Descriptive statistics was used to produce statistics for each variable or for subsets within a variable. Chi-square test, to test the association between variables over the hypothesis, Kruskal-Wallis, One-way Analysis of Variance test to check the equality of medians for two or more populations, two sample t test to test and compute a confidence interval of the difference between two population means, one-way ANOVA, one-way analysis of variance, with the dependent variable in one column, subscripts in another and Friedman test to analyze a randomized block experiment. Principal component techniques were used to see the overall effect of variables.

Pilot study

A pilot study was conducted in two phases, in order to evaluate the appropriateness of the questionnaire for gathering data relevant to this study from a wide range of users. First, two peers were selected and allowed to do the necessary amendments. They completed the questionnaire individually. Based on their comments the questionnaire was amended. Secondly, a sample of 25 first year students, were selected from four faculties in the University of Sri Jayewardenepura and they were asked to complete the questionnaire individually and obtained the comments. Some of the improvements were done based on their comments.

Further, it was observed that some of the respondents took time to understand and fill in the questionnaire. The problem was identified as the language barrier and subsequently questionnaires were set in two languages, Sinhala and English. It was decided to use a facilitator to explain the questions in Tamil in the universities where the majority is Tamil. In addition, the importance of having group clarifications was identified for collecting accurate data within a limited time period.

Further, it was identified from the pilot study that there was no diversity of ICT access among faculties. Therefore, selecting the faculty as a stratum in stratified sampling was omitted.

Results

The completed questionnaires returned was 89.54% (1601) and most of the respondents were female students (65%). Also the largest percentage of respondents was Sinhalese students (81.1%) and the lowest percentage of respondents was Malays (0.02%). Further it showed that most of the respondents were from suburban areas (45.7%). Besides, the majority of students (66.5%) who responded to the questionnaire were those who have followed some form of introductory computer course before entering the university.

Access to ICT

55.1% of students had facilities to access desktop/portable computer at any time while 17.5% do not have this facility. The largest percentage (86.71%) that had the facility to access desktop/portable computer at any time were IT students as depicted in Figure 1. As shown in the figure above 50% of Agriculture, Architecture, Engineering, Medical, Management and Science students have facilities to access desktop/portable computer at any time. But this percentage is comparatively low for the Law and Arts students.

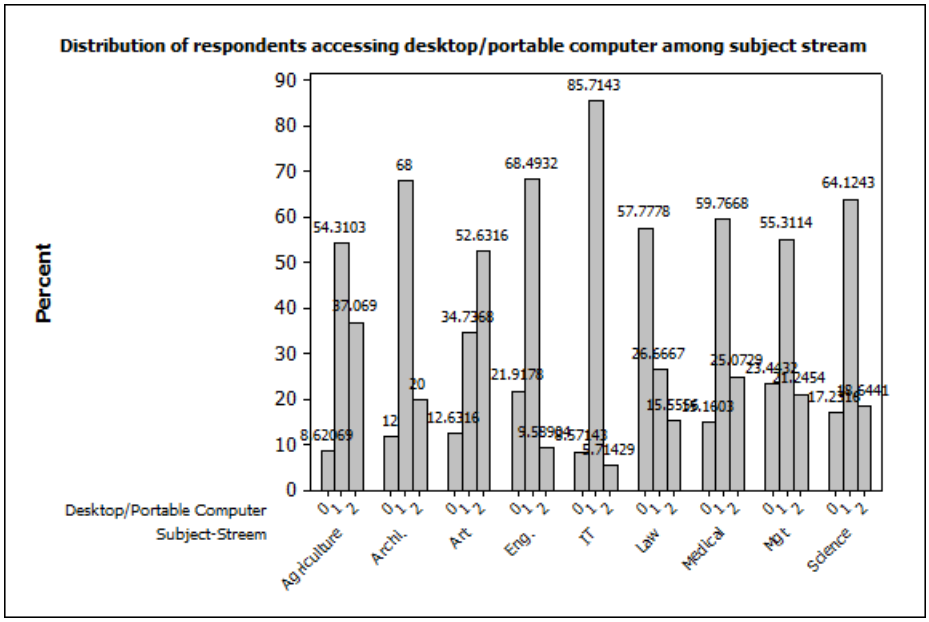


Figure 1. Distribution of respondents accessing desktop/portable computer according to their subject streams

Urban students among them were 72.41% and the rural students 38.91%. Access to Internet at any time amongst rural students was very low (38.4%), but was 58.43% amongst urban students. However, the majority of the students (97.3%) used mobile phones with various applications. Some had facilities to access the Internet at anytime with their mobile phones.

Use of ICT

Respondents were asked how often on average they had used technologies under the different 22 ICT related activities in the four main skill domains (Madigan, Goodfellow & Stone, 2007); Basic computer usage, Applications, Internet/E-mail and Research/academic activities. Table 1 summarizes the frequencies of using ICT related activities under these 4 skill domains.

As shown in the table, it was found that the majority of the respondents have used word processing (90.04%) and less (21.61%) had used the World Wide Web (WWW).

In the basic computer usage domain, most of the students had used computer software related activities such as operating systems, installing and removing programs (70.07%) and file management related activities such as creating and deleting folders etc (77.02%). There was a significant gender difference (Kruskal-Wallis test p-value=0.00) in usage frequencies of basic computer knowledge related activities and it was higher for male students than females. Usage frequencies of all the basic computer related activities significantly differed (Kruskal-Wallis test p-value=0.000) among the subject streams. The usage was higher for IT students and it was lower for the Law students. Usage

frequencies of basic computer related activities were higher for the students who had completed an introductory computer course/s before entering the university (Kruskal-Wallis test p-value= 0.002).

When considering the computer applications domain, majority had used word processing such as Microsoft Word (90.04%), Spreadsheets (Microsoft Excel) (83.53%), Presentation packages (Microsoft Power Point) (83.22%) and Database handling (Microsoft Access) (67.29%). The usage frequency of computer applications was significantly higher for male students than female students (Kruskal-Wallis test p-value 0.013). Further it was also higher for the urban students (Kruskal-Wallis test p-value= 0.000). The usage frequency of computer applications significantly differed within subject disciplines (Kruskal-Wallis test p-value is 0.017). Comparatively, IT students' usage was higher than the others. Frequency of using Microsoft Word, Microsoft Excel, and Microsoft PowerPoint was higher for the students who had followed introductory computer course/s (Kruskal-Wallis test p-value= 0.000).

The usage frequency of Internet/E-mail was higher for the male students than the females (p-value is 0.001) and further it was higher for the IT students (Kruskal-Wallis test p-value is 0.000). Most of the IT students had used Internet/ e-mail for research or academic related activities than the others (Kruskal-Wallis test p-value =0.000). 69.89% had searched for information on databases, catalogues, search engines etc.

There was a significant gender difference (Kruskal-Wallis test p-value=0.008) on the ICT usage frequencies on research/ academic related activities. Usage frequencies were higher for the male students than females. Most of the urban students had used Web more frequently for search information research or academic related activities than others (Kruskal-Wallis test p-value is 0.000). IT and Architecture students were rated higher than other students for searching the Web for information and using the library websites. IT and Engineering students had more frequently used the university website than others (Kruskal-Wallis test p-value is 0.000).

Table I. Percentages of respondents according to the frequencies of ICT used

	Domain	Activity	Daily	Several times per week	Weekly	Monthly	Every few months	Yearly	Total	Not used
1	Basic computer knowledge	Computer hardware	6.39	13.68	17.67	17.10	24.29	20.87	57.09	42.91
2		Computer software	8.62	17.61	19.46	21.04	20.95	12.33	70.07	29.93
3		File management	24.89	25.32	21.87	14.80	8.24	4.88	77.02	22.98
4		CD burning including data and music files	8.74	17.48	20.60	27.26	16.55	9.37	62.67	37.33

5		File transfer applications	6.30	15.74	19.44	22.78	17.04	18.70	35.31	64.69
6	Applications	Word processing such as Microsoft Word	12.91	27.26	25.54	18.22	12.41	3.66	90.04	9.96
7		Spreadsheets such as Microsoft Excel	5.98	16.38	21.50	23.78	20.94	11.42	83.53	16.47
8		Database handling such as Microsoft Access	3.83	10.42	16.81	21.04	27.04	20.85	67.29	32.71
9		Presentation packages such as Microsoft PowerPoint	5.95	17.62	19.66	27.09	21.53	8.14	83.22	16.78
10		Web designing	3.04	11.27	16.10	16.46	24.15	28.98	37.48	62.52
11		Multimedia editing	4.77	12.79	12.40	21.37	22.90	25.76	34.02	65.98
12		Discipline/ Subject specific technologies	5.38	15.89	22.00	16.38	19.07	21.27	27.43	72.52
13	Internet/ E-mail	Internet browsers such as Explore, Mozilla etc.	29.29	26.65	21.55	10.91	6.60	5.01	73.45	26.55
14		Emails including attachments, global emails and save emails	20.67	25.29	22.54	15.00	10.38	6.12	72.46	27.54
15		Instant and text messaging	16.42	18.56	17.08	18.72	15.44	13.79	39.54	60.46
16		Use of Wikis, Blogs, Video websites	16.81	23.05	22.93	15.49	14.41	7.32	53.19	46.81
17		Online games	9.56	14.26	15.52	23.20	22.73	14.73	41.91	58.09
18		Social Networking websites	31.43	23.81	20.74	12.49	5.82	5.71	60.92	39.08
19		Use of WWW for other services	7.19	12.75	11.76	17.97	25.49	24.84	21.61	78.39
20	Research or academic	Web searching for information	22.00	24.58	21.72	14.42	11.00	6.28	69.89	30.11
21		Use of university website	8.61	19.16	25.75	23.99	14.59	7.91	73.02	26.98
22		Use of university Library Website	4.59	14.96	21.93	27.85	17.63	13.04	43.80	56.20

Perceived ICT skills

Respondents were asked to rate the skill level of 22 different ICT related activities under the 4 main skill domains. Summary of the results is depicted in Table II.

Table II. Percentages of respondents according to the perceived skill levels of ICT

	Domain	Activity	Not very skilled	Basic	Average	Advanced	Very skilled (Expert)	Total	Not used
1	Basic computer knowledge	Computer hardware	22.87	35.47	34.92	5.64	1.1	57.09	42.91
2		Computer software	12.56	29.48	41.31	13.28	3.37	70.07	29.93
3		File management	7.48	18.69	37.04	20.1	16.69	77.02	22.98
4		CD burning including data and music files	5.03	20.18	39.31	24.93	10.55	62.67	37.33
5		File transfer applications	9.64	26.32	39.25	18.44	6.35	35.31	64.69
6	Applications	Word processing such as Microsoft Word	16.67	34.38	35.43	10.1	3.43	90.04	9.96
7		Spreadsheets such as Microsoft Excel	6.35	22.04	41.62	21.88	8.11	83.53	16.47
8		Database handling such as Microsoft Access	23.81	34.86	27.55	10.88	2.89	67.29	32.71
9		Presentation packages such as Microsoft PowerPoint	8.77	22.42	38.23	18.77	11.82	83.22	16.78
10		Web designing	9.81	23.83	38.5	18.42	9.44	37.48	62.52
11		Multimedia editing	8.14	23.63	39.91	16.9	11.42	34.02	65.98
12		Discipline/ Subject specific technologies	9.16	22.2	37.78	20.26	10.59	27.43	72.52
13	Internet/ e-mail	Internet browsers such as Explore, Mozilla etc.	20.33	21.6	36.3	13.97	7.8	73.45	26.55
14		Emails including attachments, global emails and save emails	24.53	27.34	32.58	9.36	6.18	72.46	27.54
15		Instant and text messaging	15.02	22.46	31.66	18.09	12.76	39.54	60.46
16		Use of Wikis, Blogs, Video websites	10.56	22.69	40.78	16.5	9.47	53.19	46.81
17		Online games	12.23	27.86	36.38	15.48	8.05	41.91	58.09
18		Social Networking websites	7.72	18.82	37.63	20.51	15.33	60.92	39.08
19		Use of WWW for other services	23.63	27.21	34.84	11.93	2.39	21.61	78.39
20	Research or academic	Web searching for information	24.07	26.54	33.64	9.57	6.17	69.89	30.11
21		Use of university website	8.05	22.81	45.97	16.1	6.98	73.02	26.98
22		Use of university Library Website	14.39	26.84	40.78	13.19	4.65	43.80	56.20

Table reveals that the respondents had rated that they were more skillful in word processing, spread sheets and presentation packages. The related percentages were respectively, 90.04%, 83.53% and 83.22%. They had rated that they were not very competent on WWW (percentage is 21.61%). A significant gender difference appeared on basic computer skills and male students rated higher than female students (Kruskal-Wallis test p-value=0.000).

Basic computer skills also significantly differed among communities. Urban students were rated more skillful than others (Kruskal-Wallis test p-value=0.000). Basic computer skills of Engineering and IT students were higher than that of others (Kruskal-Wallis test p-value=0.000). Male students have rated higher than female students where skills on computer applications were concerned (Kruskal-Wallis test p-value-0.012). Urban students had a belief that they were more competent on the computer application domain than others (Kruskal-Wallis test p-value-0.000). There was a significant impact of subject disciplines on computer application skills of the respondents (Kruskal-Wallis test p-value-0.002). Those skills of Law and Arts students were lower than Medicine, Engineering and Science students.

Means, standard deviations and One-Way ANOVA F-values of skill levels on the Internet/ E-mail domain are shown for females and males in Table III.

Table III. Skill differences of Internet/E-mail related activities among gender

Activity	Female		Male		F-value	Sig.
	Mean	StDev	Mean	StDev		
Internet browsers such as Explore, Mozilla etc.	2.906	1.091	3.215	1.119	21.47	0.000
Emails including attachments, global emails and save emails	2.883	1.086	3.185	1.072	20.93	0.000
Instant and text messaging such as Skype, VoIP etc.	2.825	1.244	3.018	1.204	3.79	0.052
Use of Wikis, Blogs, Video websites (YouTube)	2.778	1.099	3.095	1.053	17.40	0.000
Online games	2.717	1.092	2.915	1.095	5.01	0.026
Social Networking websites such as Face book, MySpace, Bebo, Linkedln etc.	3.068	1.138	3.314	1.116	10.90	0.001
Use of WWW for other services	2.227	1.038	2.720	1.184	15.92	0.000
Impact for overall Internet/E-mail skill domain	0.560	2.306	-0.515	2.000	11.94	0.001

The impact of gender on overall Internet/ E-mail skills was significant under the 0.05 significance level and the Kruskal-Wallis test p-value was 0.001 as shown in the table III. Perceived skills on Internet/E-mail were higher for male students than females. The impact of the community on overall skills of Internet/e-mail related activities was significant.

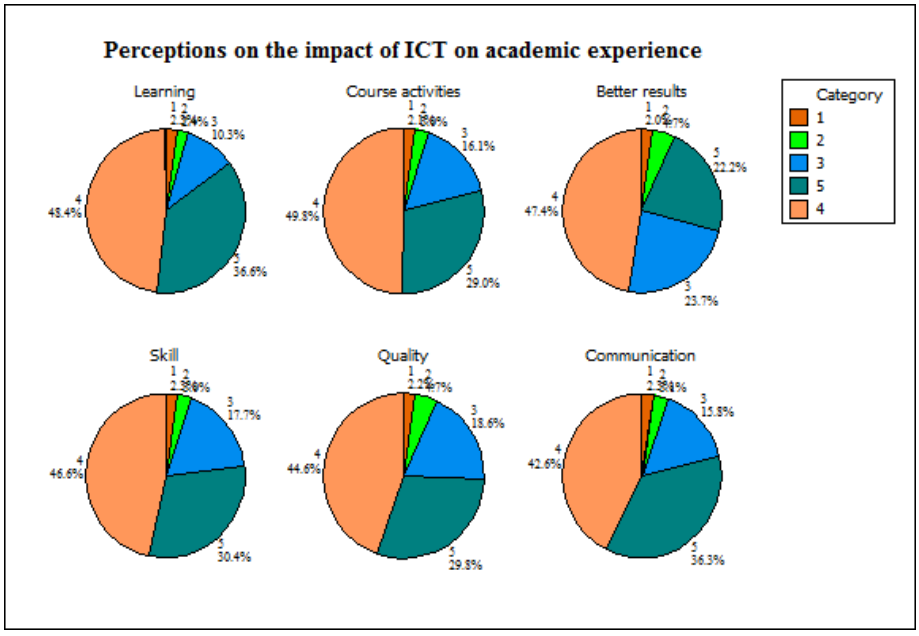
Urban students had rated as more skillful than others (Kruskal-Wallis test p-value-0.000). There was a significant difference among subject streams in overall Internet/e-mail skills of students (Kruskal-Wallis test p-value-0.000).

Urban students' perceived skills on research/academic related ICT activities were significantly higher than that of others (Kruskal-Wallis test p-value-0.000). Engineering students rated as being more skillful on ICTs on research/academic related activities (p-value-0.000). There was a significant difference between students who had followed introductory computer courses and non followers where ICT skills domain for research/academic activities was concerned (Kruskal-Wallis test p-value-0.000).

Perceptions of the impact of ICT on academic experiences

Respondents' perceptions were examined under 6 different scenarios. Distribution of the respondents according to their perceptions on ICT usage on academic experiences are summarized in Figure 2.

As shown in Figure 3.2, majority of the students (85%) believed that using ICTs may help them to improve their learning in the university. A considerable percentage of respondents (78.9%) believed that using ICTs they could communicate better and 78.8% believed that knowledge of ICTs would make it easier to perform in their course activities. A higher percentage of respondents, 77% believed the usage of ICTs would improve their IT/information management skills in general. 74.4% of students believed that using ICT would help them to improve their performance as university students. 69.6% of students believed that using ICT would help them to obtain better results at the university.



Note: 1- Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly agree

Figure 2. Distribution of students' perceptions on the impact of ICT on academic experiences

The largest percentage of students (85%) mentioned that they need to use ICTs to find information on academic purposes and the majority of them were female students. However, only 3.6% students asked for ICT facilities (Internet/ e-mail) to download software and related things and most of them were male students. Majority of the students (81.2%) wished to have more Internet/E-mail facilities in their universities in future. A considerable percentage of students (49%) believed that they needed more ICT related equipment such as laptop computers, pen drives.

Discussion & Recommendations

The study revealed that, not all universities are equipped with sufficient ICTs. The study also pointed out that the first year students in all the universities believed that ICT could enhance their learning and they wished to use ICT tools frequently. Therefore it is recommended to expand ICT facilities in the universities. The most effective place to have ICT access would be the library, which could be shared by many. It is also advisable to establish ICT facilities in the libraries of the universities since it ensures a wider access to the university community.

Freshmen who have followed introductory computer courses always rated themselves as more skillful on ICT and they have stated that they use ICT tools frequently. Therefore, it is recommended to strengthen the existing introductory computer courses for first years and introduce new programs.

The study revealed that the usage and the skills on ICT were low for Arts students and it is recommended to make existing introductory computer courses compulsory and to implement new compulsory courses for them in their faculties to produce ICT competent Art graduates suitable for the job market.

In order to encourage the use of ICT by freshmen, it is recommended that the duration of providing access to ICTs in libraries be extended. The libraries need to be kept open for extra hours and Library staff should be more helpful and assist freshmen in using ICTs.

The study revealed the first year students who came from rural areas were somewhat reluctant to use ICTs and they have rated themselves in the category of not much skilful on ICTs. Therefore it is recommended to enhance the existing programs such as Nanasalas which have been implemented by the government to improve the ICT skills of rural students.

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