ORIGINAL RESEARCH PAPER

Information and communications technology facilities at the tertiary level education in some urban universities in Bangladesh

F.M. Shahriar[1], H.M. Jahirul Haque[2], M.K. Barai[3,*]

[1]*School of Business, University of Liberal Arts, Bangladesh*
[2]*School of Science and Engineering, University of Liberal Arts, Bangladesh*
[3]*Graduate School of Management, Ritsumeikan Asia Pacific University, Oita, Japan*

ABSTRACT: With the advent of digitalization, information and communications technology facilities have become an indispensable part of education especially at the universities. This study has been undertaken with dual purposes - to find the existing scenario of information and communications technology facilities and to gauge the perception of the students onthe quality of those facilities - at the universities in Bangladesh. To that end, a survey was conducted on the undergraduate and graduate students of 9 private and public universities. To assess the quality of information and communications technology services, participants' views on various aspects like the sufficiency of computers, availability of required software, maintenance and troubleshooting, internet and data sharing facilities, etc. were collected and analyzed. The study finds that although students are on the happier side with the information and communications technology installations and equipment, they are fairly unhappy about the maintenance services and internet facilities available at their universities. It gives some valuable insights about the information and communications technology facilities scenario at the universities that can be taken into consideration while planning future action plan and development of information and communications technology at the universities in Bangladesh.

INTRODUCTION

To draw a conceptual outline, Information and Communications Technology (ICT) encompasses a diverse set of technological tools and resources used to communicate, create, disseminate, store, and manage information (Blurton, 1999; Cross and Adam, 2007). The term ICT is used to describe a range of equipment, computer programs and the telecommunications infrastructures that allow us to access, retrieve, store, organize, manipulate, present, send material and communicate locally, nationally and globally through digital media (Dunmill and Arslanagic, 2006).

Surprisingly, in a short period of time, ICT has revolutionized particularly the service industries all over the world including the education sector. As could be seen, the growth of ICT has dramatically reshaped higher education through offering powerful learning environments transforming the learning and teaching into an active, self-directed and constructive process (Pulkkinen, 2007; Wood, 1995; Volman and Van-Eck, 2001; De Corte *et al.*, 2003; Plomp *et al.*,2007). That is why, during the last two decades, the implementation of ICT in education has become an important topic in research on educational reform (Drent and Meelissen, 2008). Expectedly, research findings too reveal the

✉ *Corresponding Author Email: baraimk@apu.ac.jp*
  Tel.: +9190 5101 3908

positive effects of the use of ICT on capabilities, confidence level and self-esteem of the students (Mumtaz, 2000; Hattie, 2009; Casal, 2007). Moreover, the attainment and effective usage of ICT facilitate students' learning and preparation for participating in the information society (Kozma, 2005; Bhattacharya and Sharma, 2007).

As a result, ICT has inevitably become more critical for the academic institutions by dint of its growing power and capabilities to abreast a changing educational environment (Pajo and Wallace, 2007). However, the effective use of ICT facilities requires the availability of equipment, accessories and proper maintenance (Khan *et al.*, 2012) that would develop students' skills for cooperation, communication, problem solving and lifelong learning (Plomp *et al.*, 2007; Voogt, 2003).

Successful implementation of ICT, therefore, requires strong intervention and support from institutions (Cross and Adam, 2007). Focusing more on the education sector, we find that the rapid growth of the use of technology and systems is changing the nature of education in the new millennium. The academic institutions, especially those in the tertiary level, are being forced to integrate ICT as a core structure of academia (Hossain *et al.*, 2016) to ensure enhanced learning and teaching (Bairagi *et al.*, 2011). The initiatives and interventions to develop ICT facilities and infrastructures in educational institutions are mostly driven by the globalization of information and knowledge resources (Islam and Islam, 2007) and societal pressure (Blurton, 1999). As a result, tertiary educational institutions, especially universities around the world are increasingly developing and using ICT facilities to pace with rising expectations and technological advancements and to facilitate a multi-dimensional learning environment (Dunmill and Arslanagic, 2006).

In the context of Bangladesh, the higher education scenario has significantlybeen transformed after 1990. In fact, Bangladesh kept the higher education sector in the public domain for a couple of decades since the liberation in 1971. But an important development took place with the enactment of the Private University Act in 1992 that allowed private bodies to establish universities. The effect of this could be seen from the fact that as of July 2015, there were 68 academically active private universities with 20 more in the queue to join. They are operating along with another 37 public universities offering general, science and technology education (Barai *et al.*, 2015). Due to the emergence of private universities, the transformation of the higher education sector in Bangladesh is evident. However, most of the universities, both private and public, offer a range of ICT facilities required to run a modern university.

These facilities include well-designed classrooms equipped with modern teaching aids like overhead projector, videocassette players, multimedia projector, computer terminals connected to LAN, on campus Wi-Fi, libraries with complete automation, computer and other labs, etc. Not only that, universities in Bangladesh are playing a pioneering role in developing ICT infrastructure and making ICT facilities available to the students (Roknuzzaman, 2006).Although nowadays, the internet is an indispensable part of ICT facilities, it was, nevertheless, found that a large number of students in various universities in Bangladesh had limited or no access to the internet (Rabbani and Chowdhury, 2014). That motivated the authors of the paper to investigate the state of available ICT facilities – the depth, reach and quality - at the universities in Bangladesh. Keeping these objectives in mind, this paper has attempted to identify a holistic picture of the quality of ICT facilities in the universities of Bangladesh. In doing so, the paper has given more emphasize on the viewpoint of the students.

In congruence, the study takes intocognizance of how they do view or see the development of ICT in their respective institutions. Therefore, a study on the perceived quality of ICT facilities carries significance as it may indicate or provide a picture of the overall development of ICT in the country. A similar study by Haque and Khan (2010) has been used as a reference for the study.

The rest of the paper has been divided into five more parts. Part two identifies the objectives of the paper. A brief methodology has been given in part three. Part four includes the descriptive

statistics of the sample and analyzes the results of the regression. Part five concludes the paper.

Objectives

The primary objective of the study is to create a picture of the ICT facilities available for the students at the tertiary level institutions, both private and public universities, in Bangladesh. The ICT scenario has been described through a number of benchmark variables like availability of computers and software programs, theeffectiveness of maintenance and troubleshooting, the usefulness of equipment and networking facilities and speed of theinternet.

The secondary objective of the study is to construct a model of perceived quality of ICT facilities from a student's perspective through the use of the benchmark variables used for the study. As a part of the study,a regression model has been constructed to test the importance and relevance of the variables to explain the overall quality of the ICT facilities available to the students in the selected universities in Bangladesh.

This study has been carried out at the tertiary educational level in some universities in the urban areas of Dhaka, Bangladesh during January to April 2016.

MATERIALS AND METHODS

The study is descriptive in nature. The population of the study comprises the students studying in private and public universities of Bangladesh. Snowball sampling technique has been adopted for the study to build a sample of 265 students from 9 universities, six of them are in the private sector. They are namely Bangladesh University of Engineering and Technology (BUET), Eastern University (EAU), International University of Business Agriculture and Technology (IUBAT), Jagannath University (JNU), North-South University (NSU), Stamford University (STU), State University of Bangladesh (SUB), University of Dhaka (DU) and University of Liberal Arts Bangladesh (ULAB).

Data were collected from the sampled students through a questionnaire survey, a method which has been proven effective in similar studies on students' perception and attitude towards ICT (Islam and Fouji, 2010; Bairagi *et al.,* 2011; Abdelaziz *et al.,* 2013). In Bangladesh, there are 37 public and 91 private universities as of May 2016. Therefore, to ensure equitability of data, the number of private and public universities taken under the study is 6 and 3 respectively. The questionnaire sought to measure students' perception of ICT facilities on their respective campus on a 5-point itemized rating scale (Likert scale) ranging from 'strongly disagree' to 'strongly agree', as used in similar studies on students (Dorup, 2004; Gay *et al.*, 2006).

The variables for the study have been identified and determined through secondary data analysis and qualitative studies i.e. discussion. The survey has been done between January and April 2016. Computerized statistical programs have been used to generate outcomes of the survey data for both descriptive and regression analysis. The analyses of data are mostly descriptive which has been suggested for this type of studies (Cohen, 1968; Daramola and Odunsi, 2007).

A general linear multiple (GLM) regression model has been created by using the variables to relate them to the holistic perception of the students, which is common in studies on students' attitude (Peeraer and Van Petegem, 2009; Cohen, 1968). Although the data are technically ordinal, the use of continuous variable methods like GLM regression have been supported by a number of scholars like Winship and Mare (1984), Allan (1976), Borgatta (1968), Kim (1978), Labovitz (1970) and O'Brien (1979), among others, who claimed that the power and flexibility of such methods outweigh the small biases they may entail. Grace-Martin (2008), Lubke and Muthen (2004) and Glass *et al*. (1972) have also implied that data from Likert Scale with at least 5 categories can be used for the parametric test in some situations where the differences between the ordinal categories are considered equal. The strongest of the opinions in favor of using ordinal data for tests like regression has been given by Norman (2010) where he strongly implies that data from Liker scale is significantly capable of yielding accurate outcomes as like as continuous data.

RESULTS AND DISCUSSION
Descriptive Statistics

The respondents of the study came from both public and private universities. The institution-wise and category-wise distribution of respondents and the summary of the responses are shown in Table 1.

Table 1: Institution-wise and category-wise distribution of the respondents

Institution-wise distribution			Category-wise distribution		
Name	Frequency	Percent	Category	Frequency	Percent
BUET	32	12.1			
JNU	35	13.2	Public	102	38.5
DU	35	13.2			
IUBAT	1	0.4			
NSU	36	13.6			
STU	34	12.8			
SUB	26	9.8	Private	163	61.5
EAU	36	13.6			
ULAB	30	11.3			
Total	265	100.0	Total	265	100.0

Constructed from the survey data.

Table 2: Summary of responses

Issues	Mean	SD	Issues	Mean	SD
Number of computers	3.37	1.446	Internet facility	3.45	1.322
Printing facilities	2.98	1.373	Speed of internet	3.16	1.364
Condition of ICT equipment	3.26	1.29	Data sharing facilities	3.15	1.341
Power back-up facilities	3.29	1.412	Availability of IT staffs	3.42	1.312
Usefulness of provided software	3.35	1.391	Service quality of IT staffs	3.51	1.247
Regularity of software updates	2.99	1.369	Timely solutions for IT related issues	3.44	1.23
Availability of necessary software	3.16	1.3	Overall perceived quality of ICT facilities	3.43	1.324
Effectiveness of Antivirus software	2.90	1.411			

Constructed from the survey data.

Responses of the students regarding various aspects of the ICT facilities available in their respective institutions have been summarized in Table 2. A graphical projection of the mean values of the responses is given through a radar graph in Fig. 1.

From the projection of responses, it can be seen that students have a mere positive attitude towards most of the aspects of ICT facilities available at the universities, where they have given mean scores 3.15 to 3.57 on a 5-point scale. For the cases of theeffectiveness of antivirus software, regularity of software updates and printing facilities, they have given scores below 3 which indicate their negative attitude towards the quality of the facilities available.

Regression analysis

A regression test has been conductedthrough the use of the variables of the study to relate them to the overall perceived quality of ICT facilities by the students. In the regression test, we accepted 'the overall perceived quality of ICT facilities' as the dependent variable (Table 3). Initially, it was assumed that a total of 14 explanatory variables, e.g. Number of computers, Printing facilities, Condition of ICT equipment, Power backup facilities, Usefulness of provided software, Regularity of software updates, Availability of necessary software, Effectiveness of antivirus software, Availability of internet, Speed of internet, Data sharing facilities, Availability of IT staffs, Service quality of IT staffs, Timely solution of IT related issues will be able to significantly explain the quality aspect of the ICT facilities in the universities.

The regression test considered all the variables to estimate the model and yielded an R value of 0.731 and R-Square value of 0.534 (Table 4). This means there is a mentionable level of correlation between the dependent

and independent variables and approximately 53% of the variations in the dependent variables can be explained by the model. The F-test, which was used to test the significance of the whole model, yielded a p-value of 0.000, which is significant at 5% significance level (Table 5). This indicates that the variations in the dependent variable are duly explained by the model. A further analysis of the results from Table 6 points to the fact that 4 out of the 14 coefficients namely, Printing facilities (Print_Fac), Usefulness of provided software (Use_Soft), Service quality of IT staffs (Staff_Qual) and Prompt services for IT issues (Prompt_Sol) were found to be not significant and therefore included in the regression equation. The rest 10 were found to be significant and therefore removed from the regression equation (Table 6).

The resulting regression equation for the model based on the results of Table 6 (with significant coefficients removed) can be expressed as Eq. 1.

$$\text{ICT\_Qual} = -0.003 + 0.178*\text{Print\_Fac} + 0.116*\text{Use\_Soft} + 0.273*\text{Staff\_Qual} + 0.214*\text{Time\_Sol} \tag{1}$$

From the above equation, it can be seenthat only 4 out of 14 variables are capable of explaining the variations in the dependent variable. Moreover, the value R-Square (0.534) implies that nearly half of the
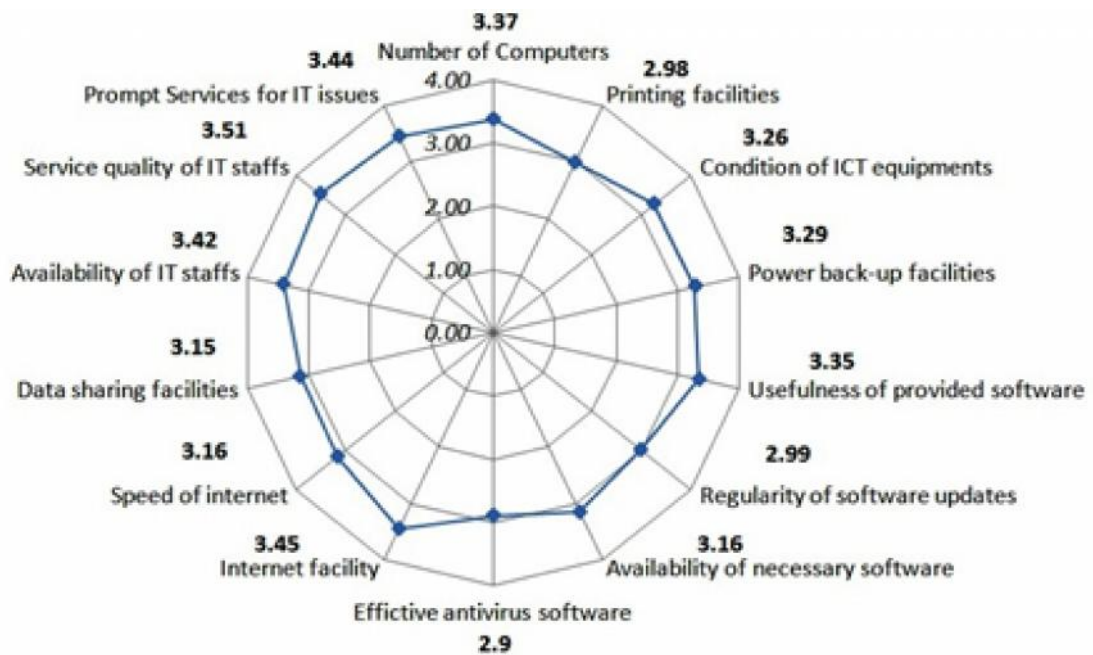

Fig. 1: Radar graph of the mean values of the responses

Table 3: Variables entered/removed

Model	Variables Entered	Variables Removed	Method
1	All requested variables entered	None	Enter

Constructed from the survey data.

a. Dependent Variable: The overall perceived quality of ICT facilities

Table 4: Model summary

Model	R	R square	Adjusted R square	SE of the estimate	Durbin-watson
1	.731[a]	.534	.508	.928	1.804

Constructed from the survey data.

a. Predictors: (Constant), Number of computers, Printing facilities, Condition of ICT equipment, Power backup facilities, Usefulness of provided software, Regularity of software updates, Availability of necessary software, Effectiveness of antivirus software, Availability of internet, Speed of internet, Data sharing facilities, Availability of IT staffs, Service quality of IT staffs, Timely solution of IT related issues.

b. Dependent Variable: The overall perceived quality of ICT facilities

Table 5: ANOVA

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	247.351	14	17.668	20.500	.000[b]
	Residual	215.464	250	.862		
	Total	462.815	264			

Constructed from the survey data.

a. Predictors: (Constant), Number of computers, Printing facilities, Condition of ICT equipment, Power back-up facilities, Usefulness of provided software, Regularity of software updates, Availability of necessary software, Effectiveness of antivirus software, Availability of internet, Speed of internet, Data sharing facilities, Availability of IT staffs, Service quality of IT staffs, Timely solution of IT related issues.

b. Dependent Variable: The overall perceived quality of ICT facilities.

Table 6: Coefficients

Model	Un-standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.003	.222	-	-.013	.990
Number of computers (Num_PC)	.061	.047	.067	1.290	.198
Printing facilities (Print_Fac)	.178	.058	.184	3.077	**.002**
Condition of ICT equipments (Equip_Con)	.012	.065	.012	.187	.852
Power back-up facilities (P_Back)	-.014	.054	-.015	-.261	.795
Usefulness of provided software (Use_Soft)	.116	.058	.122	1.997	**.047**
Regularity of software updates (Soft_Up)	.074	.063	.077	1.177	.240
Availability of necessary software (Soft_Avail)	.074	.061	.073	1.213	.226
Effectiveness of antivirus software (Eff_AV)	-.002	.058	-.002	-.030	.976
Internet facility (Int_Avail)	.025	.062	.025	.400	.689
Speed of internet (Int_Speed)	.067	.058	.069	1.146	.253
Data sharing facilities (Data_Sh)	.031	.057	.031	.540	.589
Availability of IT staffs (Staff_Avail)	-.067	.064	-.066	-1.040	.299
Service quality of IT staffs (Staff_Qual)	.273	.071	.257	3.856	**.000**
Timely solutions for IT related issues (Time_Sol)	.214	.069	.198	3.100	**.002**

Constructed from the survey data.

a. Dependent Variable: The overall perceived quality of ICT facilities (ICT_Qual)

Table 7: Residuals statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.00	5.21	3.43	.968	265
Residual	-3.555	2.032	.000	.903	265
Std. Predicted Value	-2.510	1.839	.000	1.000	265
Std. Residual	-3.830	2.189	.000	.973	265

Constructed from the survey data.

a. Dependent Variable: The overall perceived quality of ICT facilities (ICT_Qual)

variation in the dependent variable cannot be explained by the model (Table 7). One of the justifications of the nature of the model might be that students are mostly using ICT facilities (i.e. computers, the internet) on their own while they are at the university campus (Rabbani and Chowdhury, 2014). Therefore, they might not have definite attitudes towards the ICT facilities provided by their institutions. To minimize the anomalies in the model, studies on larger sample with pre-screened respondents should be conducted to re-create the same.

To further investigate any possible autocorrelation between the 14 explanatory variables, a correlation matrix of all the variables (including the model and residual) has been developed, which is shown in the following Table 8.

No significant correlations between the variables including the four explanatory variables of the equation (Print_Fac, Use_Soft, Staff_Qual and Time_Sol) are seen either-ways. Moreover, the values of the correlations may not always be reliable and definitive if the sample size is relatively small, as found in this case (Bates *et al.*, 1996; Sharp and Gahlinger, 1998). The values of correlation may become further definitive if larger samples are employed for such studies.

Table 8: Correlation Matrix

	Num_Sat	Print_Fac	Equip_Con	P_Back	Use_Soft	Soft_Up	Soft_Avail	Eff_AV	Int_Avail	Int_Speed	Data_Sh	Staff_Avail	Staff_Qual	Time_Sol
Num_PC	1	0.04	0.05	0.09	0.03	0.18	0.13	0.06	0.08	0.03	0.13	0.09	0.16	0.13
Print_Fac		1	0.04	0.05	0.07	0.08	0.10	0.19	0.19	0.15	0.06	0.09	0.02	0.11
Equip_Con			1	0.09	0.08	0.15	0.04	0.08	0.23	0.06	0.01	0.06	0.03	0.09
P_Back				1	0.11	0.17	0.07	0.05	0.07	0.07	0.09	0.05	0.03	0.14
Use_Soft					1	0.12	0.18	0.03	0.10	0.02	0.18	0.06	0.03	0.06
Soft_Up						1	0.16	0.14	0.18	0.13	0.09	0.10	0.12	0.08
Soft_Avail							1	0.19	0.15	0.11	0.16	0.05	0.02	0.07
Eff_AV								1	0.04	0.14	0.11	0.07	0.08	0.05
Int_Avail									1	0.19	0.12	0.14	0.14	0.09
Int_Speed										1	0.13	0.06	0.05	0.09
Data_Sh											1	0.12	0.18	0.16
Staff_Avail												1	0.26	0.21
Staff_Qual													1	0.24
Time_Sol														1

CONCLUSION

The study has been conducted on a limited scale covering about ten percent of the operating universities in Bangladesh. But the survey has been conducted on those universities which clearly represent the whole population. However, the results of the survey point to some interesting developments. On the one hand, the students are somewhat happy with the sufficiency of the equipment and infrastructure, though they are yet to reach to an optimum level. This clearly indicates that the universities in Bangladesh are investing in the development and integration of ICT facilities for their students. This is surely a positive movement towards assisting and offering a better education to the university students.

On the other hand, when it comes to the quality of ICT facilities, most of the students do not perceive them as satisfactory. At the same time, they do not feel that the overall quality of such facilities is very high. A number of factors might have contributed to such a feeling. The study shows that students are quite unhappy with the maintenance and service of ICT related issues. Most of the time the software is outdated and unprotected; speed of internet is unsatisfactory; data sharing facility is limited and condition of the equipment is poor. These are areas where the development of effective support ICT structures and skilled HR are called for. But, as has been pointed out, the study has been conducted on a limited scale. Further study on all of the universities of Bangladesh (105 as in 2016) may be done to get a true picture of the ICT development scenario from a much bigger perspective of the students.

ACKNOWLEDGEMENT

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

REFERENCES

Abdelaziz, N.; Shahrir, J.D.; Leng, C.H., (2013). Measuring attitude toward Computer and internet usage among postgraduate students in Malaysia. Turk. Online J. Educ. Tech., 12(2): 200-216 (**17 pages**).

Allan, G.J.B,. (1976). Ordinal-scaled variables and multivariate analysis: comment on Hawkes. Am. J. Sociol., 81: 1498-1500 (**3 Pages**).

Bairagi, A.K.; Rajon, S.A.A.; Roy, T., (2011). Status and Role of ICT in Educational Institution to Build Digital Society in Bangladesh: Perspective of a Divisional City, Khulna. Int. J. Adv. Eng. Technol., 1(4): 374-383 (**10 Pages**).

Barai, M.K.; Bala, S.K.; Suzuki, Y.; Saha, B.B., (2015). Higher Education in Private Universities in Bangladesh: A Model for Quality Assurance. Evergreen Joint J. Novel Carb. Resou. Sci. Gr. Asia Str., 2(2): 24-33 (**10 Pages**).

Bates, B.T.; Zhang, S.; Dufek, J.S.; Chen F.C., (1996). The effects of sample size and variability on the correlation coefficient. Med. Sci. Sport Exer., 28(3): 386-391 (**6 Pages**).

Bhattacharya, I.; Sharma, K., (2007). India in the knowledge economy – an electronic paradigm. Int. J. Educ. Manage., 21(6): 543-568 (**26 Pages**).

Blurton, C., (1999). New Directions of ICT-Use in Education, World Communication and Information Report, UNESCO.

Borgatta, E., (1968). My student, the purist: a lament. Sociol. Quart., 9: 29-34 (**6 Pages**).

Casal, C.R., (2007). ICT for education and development. Info ISSN: 1463-6697, 9(4): 3-9 (**7 Pages**).

Cohen, J., (1968). Multiple regression as a general data-analytic system. Psychol. Bull., 70(6): 426-443 (1**8 Pages**).

Cross, M.; Adam, F., (2007). ICT Policies and Strategies in Higher Education in South Africa: National and Institutional Pathways. High. Educ. Policy, 20(1): 73-95 (**23 Pages**).

Daramola, O.; Odunsi, O., (2017). Determinants of students perceived manmade environmental hazards and risks in tertiary educational institutions. Global J. Environ. Sci. Manage., 3(1): 43-50 (**8 pages**). (In Press)

De Corte, E.; Verschaffel, L.E.; Entwistle, N.E.; Van Merrienboer, J.E (eds.), (2003). Powerful learning environments: unraveling basic components and dimensions. Pergamon/Elsevier, Oxford.

Dorup, J., (2004). Experience and attitudes towards information technology among first-year medical students in Denmark: Longitudinal questionnaire survey. J. Med. Internet Res., 6(1): e 10, Available at: http://www.jmir.org/2004/1/e10/ (Accessed 31 May 2016).

Drent, M.; Meelissen M., (2008). Which factors obstruct or stimulate teacher educators to use ICT innovatively? Comput. Educ., 51(1): 187-199 (**13 Pages**).

Dunmill, M.; Arslanagic, A., (2006). ICT in Arts Education, Literature Review. University of Canterbury, New Zealand.

Glass, G.V.; Peckham, P.D.; Sanders, J.R., (1972). Consequences of failure to meet assumptions underlying the analyses of variance and covariance. Rev. Educ. Res., 42(3): 237-288 (**52 Pages**).

Gay, G.; Mahon, S.; Devonish, D.; Alleyne, P.; Alleyne, P.G., (2006). Perceptions of information and communication technology among undergraduate management students in

Barbados. Int. J. Educ. Dev. Using Inf. Commun. Technol., 2(4): 6-17 (**12 pages**).

Grace-Martin, K., (2008). Can Likert Scale Data ever be Continuous? Available at: http://www.theanalysisfactor.com/can-likert-scale-data-ever-be-continuous/ (Accessed 01 June 2016).

Haque, H.M.J.; Khan, M.H., (2010). Quality of ICT Services at Higher Educational Institutions of Bangladesh. ULAB J. Sci. Eng., 1(1): 42-47 (**6 pages**).

Hattie, J.A.C., (2009). Visible learning: A synthesis of 800+ meta-analyses on achievement. Routledge, Abingdon.

Hossain, M.A.; Salam, M.A.; Shilpi, F.; Officer, A.D., (2016). Readiness and Challenges of Using Information and Communications Technology (ICT) in Higher Education of Bangladesh. Online J. New Horizons Educ., 6(1): 123-132 (**10 pages**).

Islam, M.S.; Fouji, M.H., (2010). The Impact of ICT on Students' Performance: A Case Study of ASA University Bangladesh. ASA Univ. Rev., 4(2): 101-106 (**6 pages**).

Islam, M.S.; Islam, M.N., (2007). Use of ICT in Libraries: An Empirical Study of Selected Libraries in Bangladesh, Libr. Philos. Pract. E-J., Available at: http:// tojde.anadolu.edu.tr /tojde21/articles/islam.htm (Accessed 27 May 2016).

Khan, M.S.H.; Hasan, M.; Clement, C.K., (2012). Barriers to the Introduction of ICT into Education in Developing Countries: The Example of Bangladesh. Int. J. Instruct., 5(2): 61-80 (**20 pages**).

Kim, J., (1978). Multivariate analysis of ordinal variables revisited. Am. J. Sociol., 84: 448-456 (**9 pages**).

Kozma, R.B., (2005), National policies that connect ICT-based education reform to economic and social development. Hum. Technol., 1(2): 117-156 (**40 pages**).

Labovitz, S., (1970). The assignment of numbers to rank order categories. Am. J. Sociol., 35: 515-524 (**10 pages).**

Lubke, G.H.; Muthén, B.O., (2004). Applying multigroup confirmatory factor models for continuous outcomes to Likert scale data complicates meaningful group comparisons. Struct. Equat. Model., 11(4): 514-534 (**21 pages**).

Mumtaz, S., (2000). Factors affecting teachers' use of information and communications technology: a review of the literature. J. Inform. Technol. Teach. Educ., 9(3): 319-342 (**24 Pages**).

Norman, G., (2010). Likert scales, levels of measurement and the "laws" of statistics. Adv. Health Sci. Educ., 15(5): 625-632 (**8 pages**).

O'Brien, R.M., (1979). The Use of Pearson's R with Ordinal Data. Am. Sociol. Rev., 44: 851-857 (**7 pages**).

Pajo, K.; Wallace, C., (2007). Barriers to the uptake of web-based technology by university teachers. Int. J. E-Learn. Distance Educ., 16(1): 70–84 (**15 pages**).

Peeraer, J.; Van Petegem, P., (2009). Factors Influencing Integration of ICT in Higher Education in Vietnam, Available at: http://www.vvob.be/vietnam/files/SubmissionGlobalLearnJP_v2.pdf (Accessed 28 May 2016).

Plomp, T.; Pelgrum, W.J.; Law, N., (2007). SITES2006–International comparative survey of pedagogical practices and ICT in education. Educ. Inform. Technol., 12(2): 83-92 (**10 pages**).

Pulkkinen, J., (2007). Cultural globalization and integration of ICT in education. In K. Kumpulainen (ed.), Educational technology: Opportunities and challenges, pp.13–23, University of Oulu, Oulu, Finland.

Rabbani, G.; Chowdhury, S., (2014). Quality of Higher Education in Bangladesh: Governance Framework and Quality Issues. Beykent Univ. J. Soc. Sci., 7(1): 78-91 (**14 pages**).

Roknuzzaman, M., (2006). A Survey of Internet Access in a Large Public University in Bangladesh. Int. J. Educ. Dev. Using Inf. Commun. Technol., 2(3), Available at: http:// ijedict.dec.uwi.edu/viewarticle.php?id=195&layout=html (Accessed 27 May 2016).

Sharp, D.S.; Gahlinger, P.M., (1998). Regression analysis in biological research: Sample size and statistical power. Med. Sci. Sport. Exer., 20(6): 605-610 (**6 pages**).

Volman, M.; Van-Eck, E., (2001). Gender Equity and Information Technology in Education: The Second Decade. Rev. Educ. Res., 71(4): 613–634 (**22 pages**).

Voogt, J., (2003). Consequences of ICT for Aims, Contents, Processes and Environments of Learning. In J. van den Akker, W. Kuiper, and U. Hameyer (eds.), Curriculum landscapes and trends (blz. 217–236). Kluwer, Dordrecht.

Winship, C.; Mare, R.D., (1984). Regression Models with Ordinal Variables. Am. Sociol. Rev., 49: 512-525 (**14 pages**).

Wood, D., (1995). Theory, training, and technology: Part I. Educ. Train., 37(1): 12–16 (**5 pages**).