DEVELOPMENT AND AVAILABILITY OF LATEST ICT AND MOBILE TECHNOLOGY: A DIFFERENTIAL ANALYSIS

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ABSTRACT

The present study aims to investigate the students' views towards the Development and Availability (DA) of latest Information and Communication Technology (ICT) and Mobile Technology (MT) in Hungarian and Indian universities. This paper differentiates the students' perceptions regarding ICT and MT in their academic life in relation to residence country. To test our two null hypotheses to find a statistically significant difference between means of students' responses Student t-test and Mann-Whitney U test is applied at 0.05 significant level. Total of 331 primary samples was tested to find a significant difference in IBM SPSS Statistic 20. The Cronbach's Alpha value of DA with 16 variables was calculated as 0.72. On the one hand, the results of study reveal that there is significant difference in DA of ICT and MT resources such as Internet, Automated student attendance system, Student response system, Smart classroom, email addresses, Virtual learning environment, online centralized student information system, E-Reader, E-library and workshop / seminar Policies, and other hand, country did not affect the Smart Computer laboratories, Digital devices, Computers & laptops and Social network policies. Also, we found maximum DA (98%) for Desktop Computers equipped with internet access and connected with Network and minimum DA (10%) in Virtual learning environment in an Indian University. In Hungarian University, maximum DA (97%) is found in the online centralized student information system and minimum DA (22%) in E-reading devices.

KEYWORDS

1   INTRODUCTION AND RELATED WORK

Now a day, the integration of latest Information and Communication Technology and Mobile Technology is in trends. The strength of ICT & MT assists students in learning and to improve teaching skills of educators. The application of trendy technology as a tool is mandatory for enhancing learning power of both students and boost up teaching strength of teachers. By keeping this in view, we performed both descriptive and hypothetical study on primary samples. Due to preliminary study, to differentiate the latest development and availability of ICT and MT, we have mentioned the latest related literature.

University affiliation did not affect the teachers' attitude towards ICT in higher education (Verma C., Stoffová V., & I. Zoltán., 2018) and also, university affiliation status has no impact on perception of

students (Verma C., Stoffová V., & I. Zoltán., 2018). The gender variable did not impact on the opinions of students and faculty towards information and communication awareness (Verma C., & Dahiya S., 2016). A significant difference has been found between government and private secondary school teachers towards teaching attitude about ICT (Shah S. & Thoker A., 2013) and also a major difference has been discovered in the attitude towards using ICT in teaching between the types of institutions (Thakur G., 2014). The scatteredness in the mind-set of students and faculty towards ICT knowledge has been found (Verma C., 2018). No statistically significant difference has been found in the social outlook, personal outlook and academic outlook towards internet awareness regarding usage of Internet in relation to their field or expertise (Verma C., & Dahiya S., 2016). A meaningful difference has been found between opinion of students and educators for their occupation (Verma C., 2016). There is no consequential diversity has been found in between student and faculty towards Information and communication technology awareness in relation to their state of residence (Verma C., Kumar D., & Dahiya S., 2016). A study has been performed to explore the ICT knowledge difference between students and faculty in relation to their occupation (Verma C., & Dahiya S., 2016). T-test proves that educational standard and demography of students did not affect the outlook towards ICT awareness in higher education in relation to locality and level of study (Verma C., Dahiya S. & Sharma Y., 2016).

T test is a popular statistical hypothesis test used to compare the statistical mean of samples and it is also referred as the "Student T-test" (Verma C., Stoffová V., & I. Zoltán., 2018). The Mann-Whitney U test (nonparametric) can be used to compare differences between two independent groups when the dependent variable is either ordinal or continuous, independent variable should consist of two categorical.

On hand, T-test is also playing a vital role to test hypothesis on normally distributed data having more than 30 observations. On the other hand, Mann-Whitney U test is also substitute of T-test when data is not normally distributed. To perform differential analysis, the authors applied both T-test and Mann-Whitney U which are appropriate. Following is the equation of Mann-Whitney U:

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n_2} R_i \quad (1)$$

Where:

U = Mann-Whitney U test criterion
n_1 = Sample size one
n_2 = Sample size two
R_i = Rank of the sample size

2   OBJECTIVE AND HYPOTHESIS

To explore significant difference in the development and availability of latest ICT and MT in between Indian and Hungarian universities, we framed following hypothesis to accomplish the main goal of study.
H_0: There is no significant difference in between the development and availability of ICT and MT in Hungarian and Indian University.

H_A: There is a significant difference in between the development and availability of ICT and MT in Hungarian and Indian University.

3　RESEARCH DESIGN AND METHODOLOGY

3.1　SAMPLING, VARIABLES AND DATA COLLECTION

A stratified random sampling was used to collect primary data from Indian and Hungarian University using Google form and through direct discussions. To gather data samples, a structured questionnaire was designed. The questionnaire was divided into five parts: the first one is demographic and the other four belong to ICT parameters represented by attitude (6 variables), development-availability (16 variables), educational benefits (9 variables) and usability (6 variables). A mixed approach to data scaling is applied such as nominal, binary, ordinal etc. In present study we considered only development-availability parameter having 16 variables belong to numerous questions. For this we kept the respond scale as 1-yes (DA), 2- No (NDA), 3-Do not know (UDA). These questions were decided after discussion and debate with domain expert. We have considered DA (16 variables) as dependent variable in Table 1 and Country (Indian University and Hungarian University) as an independent variable.

Table 1　Variables belong to the Development and Availability in Questionnaire

VAR-CODE	DESCRIPTION
DA1	Does your university have high speed Internet with wi-fi?.
DA2	Is your university using Automated student attendance system (e.g. Creatrix Campus)?
DA3	Is your university using student response system (e.g., ActiVote, ActivExpression or other)?
DA4	Does your university have smart classroom?
DA5	Does your university provide official email addresses to you?
DA6	Does your university have a virtual learning environment such as Moodle, Coggno?
DA7	Is there any policy in your university to conduct workshop/ seminar to learn latest ICT tools/techniques?
DA8	Does your university have policy to use social network like face-book, twitter etc.?
DA9	Is there any online centralized student information system (e.g. Neptune, others) in your university?
DA10	Are university's desktop Computers equipped with internet access and connected with Network?
DA11	Are there Internet-connected laptops, tablet PCs, netbooks or notebooks computer in your university?
DA12	Is there E-Reader (a device to read books and newspapers on screen) in your university?
DA13	Are your university using smart Computer laboratories?
DA14	Does your university have digital devices e.g. photocopy, scanner, printers, digital camera or camcorder, projector, etc.?ces
DA15	Is your university has E-library?

DA16	Is your university using latest and licensed software?

Figure 1 shows that the out of 331 students, 162 students belong to the Eötvös Loránd University of Hungary and 169 students belong to the Chandigarh University of India. Usually, the students spent approximately 15-20 minutes to complete the survey forms.
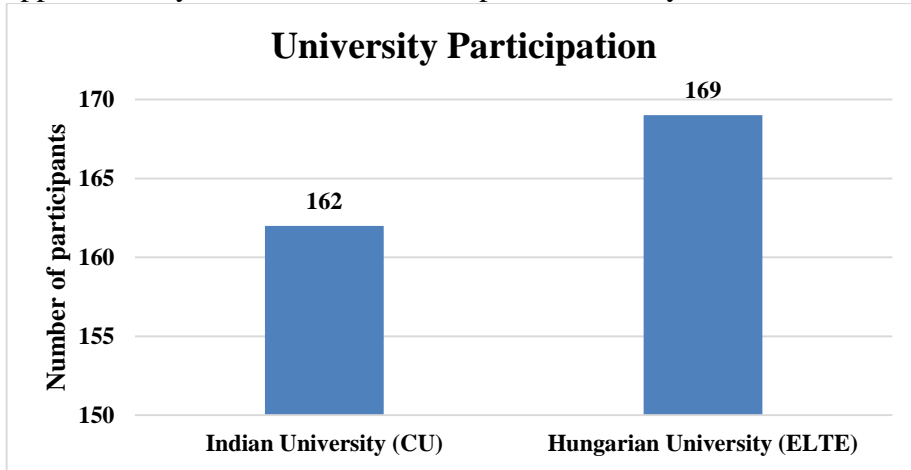

Figure 1 Participated of Universities.

There were also no queries raised from the students. The internal consistency of dataset has been tested using Cronbach's Alpha test and we found significant value 0.72 for conducting experiment.

3.2   RESEARCH TOOL AND TECHNIQUES

To determine the significant difference between two countries, independent sample Student t–test and Mann-Whitney U test was applied. In present study we have analysed the student's filled score in Microsoft Ms-Excel 2016 with extra Add-ins named Analysis Toolpack-VBA. T-test with equal variance was applied at 0.05 level of significance. IBM SPSS Statistic is also used to apply Mann-Whitney U test on dataset.

## 4   RESULTS AND DISCUSSION

4.1   DIFFERENTIAL ANALAYSIS

This section elaborates the results calculated by T-test and Mann-Whitney U test on samples at 0.05 significant level using SPSS tool.

Table 2 Indo- Hungarian University Difference in Development and Availability of ICT and MT

VAR	Name	T-Test		Mann-Whitney U Test	
		t	*p*	*z*	*p*
DA1	High speed Internet with Wi-Fi.	5.1	0.000	5.7	0.000
DA2	Automated student attendance system	3.6	0.000	3.1	0.002
DA3	Student Response System	7.0	0.000	6.3	0.000

DA4	Smart classroom	5.1	0.000	4.4	0.000
DA5	Official email addresses	5.0	0.000	5.4	0.000
DA6	Virtual learning environment	9.5	0.000	9.5	0.000
DA7	ICT workshop/ seminar Policy	8.9	0.000	7.6	0.000
DA8	Social network Policy	1.6	0.107	1.2	0.206
DA9	Online centralized student information system	6.9	0.000	7.3	0.000
DA10	Desktop Computers equipped with internet access	1.4	0.151	1.3	0.179
DA11	Laptops, tablet PCs, netbooks or notebook computers	1.4	0.137	1.1	0.258
DA12	E-Reader	5.6	0.000	5.3	0.000
DA13	Smart Computer Labs	1.6	0.095	0.7	0.473
DA14	Digital Devices	0.10	0.323	0.2	0.843
DA15	E-library	6.2	0.000	5.7	0.000
DA16	Latest and licensed software	2.5	0.011	3.3	0.001

Table 2 reveals that the statistical results calculated using T-test with unequal variance and Mann-Whitney U test at 0.05 significant level. According to both tests we found the almost identical results. For 11 variables DA1-DA7, DA9, DA12, DA15 and DA16 we found significant p-value ($p<.05$). Further, we also found t and z values significantly for these variables. Therefore, our null hypothesis H_0 is rejected and alternate hypothesis H_A is accepted for these variables. It is revealed that the development and availability of ICT and MT in Indian university is significantly differ from the development and availability in Hungarian university. For rest of 5 variables such as DA8, DA10, DA11, DA13 and DA14, the p-value is found insignificant ($p>.05$) which proves no significant difference in between the development and availability of ICT and MT in Indian university and Hungarian university. Hence, our null hypothesis H_0 is accepted and alternate hypothesis H_A is rejected for these 5 variables. It is also concluded that grouping variable country did not affect the development and availability of ICT and MT in both countries.
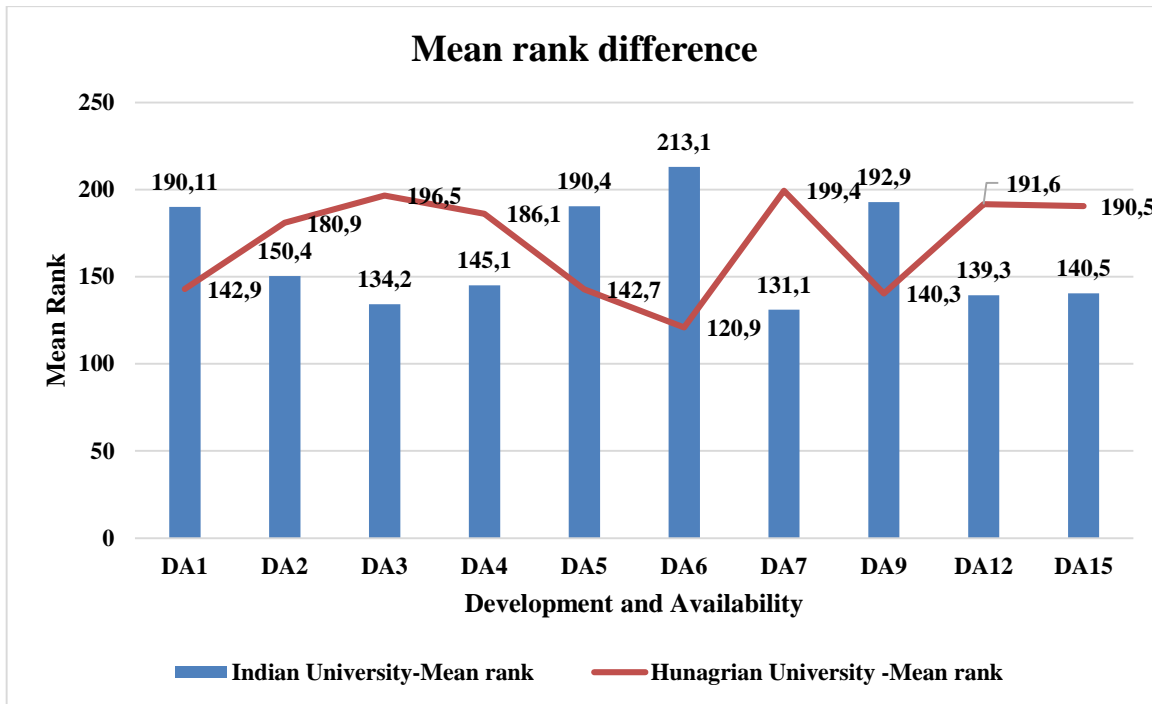
Figure 2 Mean Rank Difference using Mann-Whitney U test.

Figure 2 shows graphical view of Mean rank difference of seven variables in between Indian and Hungarian University. The highest mean rank of four variables DA1, DA5, DA6 and DA9 for Indian University proves a significant difference between two universities towards the development and availability of ICT and MT in higher education.

4.2   DESCRIPTIVE ANALAYSIS

In order to investigate the huge numbers of samples, a descriptive statistical approach is appropriate. In a nutshell, descriptive statistics aim to express a large chunk of data with abstract graph, charts and tables about the population from which the sample was taken. This section explains percentage analysis of the DA of ICT and MT in both country's University. The results are shown in Figure 3 in which x-axis presents 6 parameters such as Hungarian DA, Indian DA, Hungarian NDA, Indian NDA, Hungarian UDA, Indian UDA. Y-axis shows the percentage of these 6 parameters.
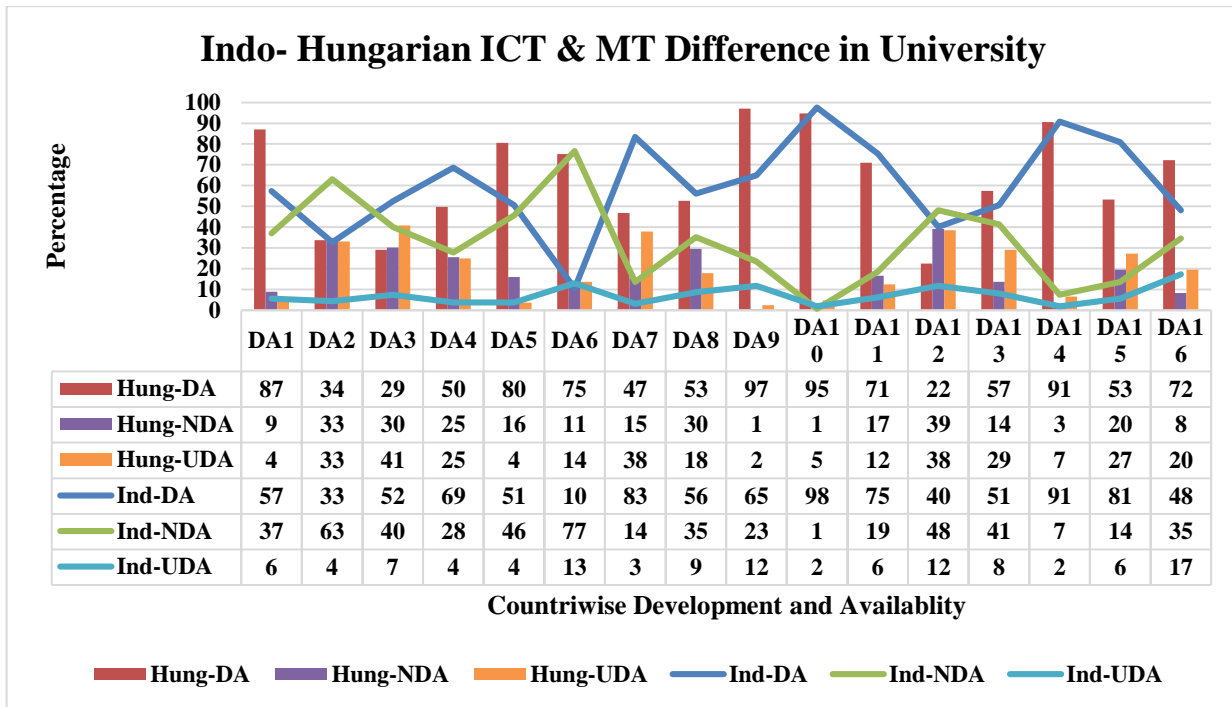
Indo- Hungarian ICT & MT Difference in University

	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10	DA11	DA12	DA13	DA14	DA15	DA16
Hung-DA	87	34	29	50	80	75	47	53	97	95	71	22	57	91	53	72
Hung-NDA	9	33	30	25	16	11	15	30	1	1	17	39	14	3	20	8
Hung-UDA	4	33	41	25	4	14	38	18	2	5	12	38	29	7	27	20
Ind-DA	57	33	52	69	51	10	83	56	65	98	75	40	51	91	81	48
Ind-NDA	37	63	40	28	46	77	14	35	23	1	19	48	41	7	14	35
Ind-UDA	6	4	7	4	4	13	3	9	12	2	6	12	8	2	6	17

Countriwise Development and Availablity

Legend: Hung-DA, Hung-NDA, Hung-UDA, Ind-DA, Ind-NDA, Ind-UDA

Figure 3 Indo-Hungarian ICT & MT difference in DA.

Figure 3 shows the responses analysis graph of two countries. On the one hand, in Indian University, the maximum DA of Desktop Computers equipped with internet access (DA10) is found 98% and minimum DA of Virtual learning environment (DA6) is found 10%. Other hand, the maximum DA of Online centralized student information system (DA9) is found 97% and minimum DA of E-reader (DA12) is found 10% in Hungarian University. Also, more than 70% DA (DA7, D11 and DA15) is found for the ICT workshop/ seminar Policy, Laptops, tablet PCs, netbooks or notebook computers and E-library in Indian University. In Hungarian University, we found more than 70% DA in Virtual learning environment, Desktop Computers equipped with internet access, Laptops, tablet PCs, netbooks or notebook computers and Latest licensed software (DA6, DA10, DA11 and DA16). It is concluded that students are much aware about these Variables. Further, results reveals that Indian University has less development in the Virtual learning environment and there is need to focusing on E-reader development in Hungarian University. On the one hand, 41% students do not know (UDA) about the Student Response System (DA3) in Hungarian University and other hand, 17% do not know (UDA) about the licensed software (DA16) in Indian University.

CONCLUSION

In this paper, the authors investigated the current scenario of ICT and MT development and availability in Indian and Hungarian University. It is concluded that the DA of ICT and MT in Indian university is significantly differ from the DA of ICT and MT in Hungarian university for variables High speed Internet with Wi-Fi, Automated student attendance system, Student Response System, Smart classroom, Official email addresses, Virtual learning environment and ICT workshop / seminar Policy. Also, country variable make impact on the DA of ICT and MT in Indian and Hungarian universities towards Online centralized student information system, E-Reader, E-library and licensed software. On the one hand authors found that the maximum DA of Desktop Computers equipped with internet access is 98% and minimum DA of Virtual learning environment is 10% in Indian University. Other hand, the maximum DA of Online centralized student information system is found 97% and minimum DA of E-reader is found 10% in Hungarian University. The present study suggested to Indian university to integrate Virtual learning environment in education. Also, E-reading services should be also providing to the students in Hungarian University.

ACKNOWLEDGMENT

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