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Digitizing Education: A Cost Benefit Analysis

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Abstract **- Use of technology has become a common practice in today's world. As the world is moving rapidly towards digital media, the role of IT in education has become increasingly important. Development of digitization can be outstanding if it can be utilized in education, research and extension activities which can be cost effective. The paper attempts to understand whether traditional approach of education can be replaced by digital mode of education or not?. This paper tries to focus upon three things Firstly; it exhibits the transition of education from a traditional educational approach to digitized approach. Secondly, it analyses the associated cost and benefits of digitized education in today's society. Finally, it attempts to propose few mechanism for incorporating digitized education and its impact in higher education scenario towards building India as a Technoscape for future advancement. The work has been analyzed using secondary data, which has further been forecasted to draw comparison between the education without implementing digitization & digitized education & is therefore quantitative research based. Finally, the outcome drawn from the study exhibits that there is a viability of 90.4% percent for education to be digitized that has been forecasted in the study for the year 2014-2015 to 2015-2016. Whereas, at the cost side of digitization it is observed that it would be an effective step in terms of both cost and quality of learning.**
Keywords: **Digitization, Institute of National Importance (INI), Technoscape**

I.INTRODUCTION

Digitization in general term is defined as 'a conversion of analog signals into digital signals'. Digitization can be used in terms of online learning, video lectures, e-books, etc., helping students for an interactive learning environment. Adoption of digitization in India has been initiated byGyanDoordarshan in the year 2000(pegu, 2014).While, IGNOU digitized 95% of its printed material and uploaded it for reading. Eventually, NPTEL, a joint initiative of the IIT's and IISc for promoting education in technology has also join hands to strengthen the call for digitized education.[(1).] Thus the use of digitized techniques made the teaching methods of continuing education more diversified and beyond time and space(luo long)[(2).]

Today's educational technology expanded the connotation of life-long education. IGNOU, IIT's have given importance to digitization but still need to change & its adoption is required by other institutes particularly for innovative and interactive learning among students.The impact of digitized education on teaching innovation has been seen in foreign countries from the study Benchmarking Teaching Innovation at Imperial College Business School with MIT-Sloan and Harvard Business School which highlights the importance of moving towards the technology enhanced classrooms by promoting automated video recording system to record some of their lectures [(3)].

Thus, with the emerging trend of digitization across the globe a new vision for learning practices is required to be evolved &adopted in Indian education landscape, such that a combination of technology and education is fused to have innovation in education that arouses interest, quest for learning & recreational means from education making it a "TECHNOSCAPE".

II. TRANSITION IN INDIAN EDUCATION SYSTEM: KNOWLEDGE-SCAPE TO TECHNO-SCAPE

Over past, learning was more teacher centric i.e. teacher serve as a source of knowledge while students serve as passive receiver. (Richards, 2006)[(4)]With the passage of time students got engaged with modern gadgets and so with the call of modernization teachers started adopting new teaching methods like projectors, power point presentations, educational software, etc., to make the education delivery mechanism efficient & retainable that enables vital learning. Having a close look at some aspects of teaching in India, specifically with respect to adoption & usage of digitalization in education, some scholarly article (techhogger,2013)[(5)]clearly evidences the adoption of technology in education system towards an efficient approach of learning. Thus, a growing country like India where education as an industry is considered to be the third largest industry in the world[(6)] needs to gear up to take up the call of digitization in education system. Thus, mechanism like Virtual Learning, Blended Learning, Collaborative and Social Learning can brings synergy in education. Students have become more receptive with aids that support visuals, graphics video, audio, retainable & time-shift approach of education.

Moreover, in an article by Jeb Bush, The Blended & Virtual, 2012.[(7)] has also stated that with a little adoption of technology (recorded lectures) in distance learning courses it could add multi dimensionality & better enrollments in education in the Universities. Thus, the study proposes to

have a progressive transition in education systems to convert from knowledge-scape to techno-scape for Next Generation education mechanism as exhibited in Figure 1.

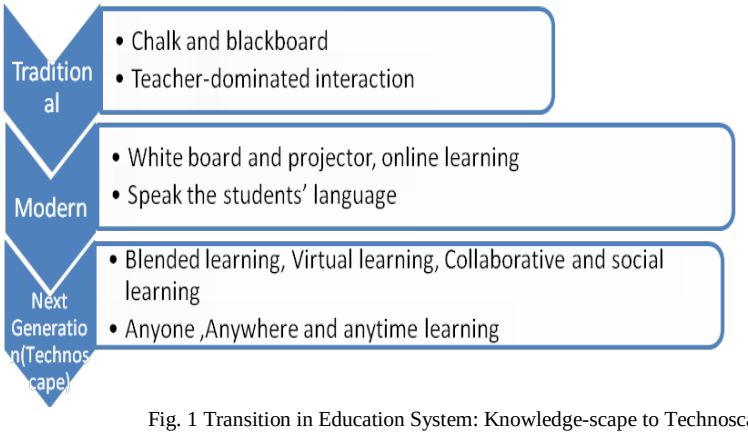

Fig. 1 Transition in Education System: Knowledge-scape to Technoscape

Thus, the above progression had been proposed to be piloted to highlight the effect it could bring to an Institute of National Importance in India known as Indian Institute of Information Technology Allahabad (IIIT-Allahabad) which is currently running both management and technical courses with an average usage of IT in this study.

III. METHODOLOGY

Financial Data from annual report of IIIT-Allahabad has been taken for the study to highlight the impact of cost for digitization both in qualitative & quantitative terms to analyses the viability of digitizing education using standard statistical &financial methods. Thereafter the data has been analyzed using secondary data which has been collected from the annual report of the institute & comparison of cost and benefit has been made from the balance sheet and receipt and payment account for the year 2011-12 and 2012 -13. Here, the institute chosen is an established institution running from the past 15 years and having average IT usage in their day to day operations particularly with respect to their teaching pedagogy.

IV. DATA ANALYSIS

The assessment for the impact of digitization, from the annual financial statement has been assumed to consider only recurring cost which is directly or indirectly related to students and teachers, ignoring the non-recurring cost. Further this data is classified into two projection groups namely, the AS IS projection group which has been extracted exactly from the annual report of the institution for the preceding previous years (2011-12 and 2012-13) and TO BE projection group,in which the data collected from the AS IS group has been projected, based on the past data's increase and decrease percentage in cost head, for the next 3 years (2014-15,2015-16 and 2016-17) which is calculated from the base year i.e. 2013-14 this calculated data is also taken from the preceding previous year's increase and decrease percentage in cost head, as data of 2013-14 was not available from the institute. This is exhibited from the Table 1 given here under.

TABLE I INCREASE OR DECREASE PERCENTAGE IN THE COST HEAD

PARTICULARS	Increase or Decrease % in cost head
Salary to teaching staff	12.88
Salary to non-teaching staff	10.50
Books (purchase)	277
Maintenance of furniture and fixtures	-10
Maintenance of computer /vehicle/equipment's	-20
Maintenance of generator	-15
Electricity charges	NA
Internet and lease line expense	-53
Travelling Allowances expenses	177
Hiring charges of vehicle/generator	-17.56
Compensation of accommodation	7.45
Contingency expenses	-7.18

Further, the AS IS and TO BE group data were posted in the cost statement form for the year 2011-12, 2012-13 & 2013-14 in Table 2 and 2014-15, 2015-16 & 2016-17 in Table 3 respectively.

The total cost in Table 2 shows the continuous increase from 2011-12 to 2012-2013 and 2013-2014.The total cost in Table 3 is increasing continuously but since our analysis is based on digitization which include additional cost head apart from Table 2 i.e., Audio video recorder, Video editing suite, Laptops or tablets, E-book and technical staff, which shows an effective decrease from 2014-15 to 2015-16.

TABLE II COST STATEMENT WITHOUT DIGITIZATION (AS IS)

(Rs. in lakh)

PARTICULARS	2011-12	2012-13	2013-14
Salary to teaching staff	461.46	520.91	587.58648
Salary to non-teaching staff	197.67	218.57	241.51985
Books (purchase)	129.97	490.88	1850.6176
Maintenance of furniture and fixtures	42.34	38.11	34.299
Maintenance of computer /vehicle/equipment's	76.35	91.32	108.67
Maintenance of generator	4.54	3.86	3.28
Electricity charges	225.36	249.08	343.97
Internet and lease line expense	33.6	15.76	33.6
Travelling Allowances expenses	21.44	59.48	164.7596
Hiring charges of vehicle/generator	35.07	28.91	23.7062
Compensation of accommodation	18.41	19.78	21.1646
Contingency expenses	176.86	164.15	151.018
TOTAL	1423.07	1900.81	3564.19

(Source:-Annual Financial Report of IIIT-A)

In the above Table II, contingencies includes expenditure on insurance, freight charges, bank charges, printing and stationary, telephone charges and advertisement. For maintaining the fixed asset, depreciation at the rate of 10% has been considered in computation & therefore the cost of furniture and fixtures for the year 2011-12 was calculated as Rs. 423.44 lakhs. Similarly, calculation of maintenance cost is done at the rate of 10% of depreciation cost of furniture and fixtures which comes to be Rs. 42.34 lakhs. The closing balance for the year was Rs. 381.10 lakhs, which has been carried forward as the opening balance for the year 2012-13. Subsequently, the maintenancecost for the year 2011-12was calculated in the same manner as in the year 2012-13 which stood as Rs.38.11 lakhs of Rs.381.10 lakhs of the maintenance cost of furniture and fixtures. While, the rate for calculating the maintenance cost of generator and computer has been calculated at 15 % and 20% respectively. The rate of electricity charges has been collected by the institute administration office, the rate provided to us was Rs.3.80 for year 2011, Rs. 4.20 per unit for year 2012, Rs.3.80 per unit for year 2011, Rs.4.20 per unit for year 2012, Rs.5.80 per unit for year 2013, Rs.6.50 per unit for year 2014 and therefore for calculation purpose the last recent unit cost of electricity was considered to be the cost unit for future calculation for future forecasted years. Thereafter, calculations for total cost of electricity have been made on the basis total cost of electricity incurred for the year 2011 divided by the total number of unit consumed by the institute. Likewise, cost of electricity is calculated for the subsequent years.

In the Table III some additional purchase of equipments that facilitates digitization in education is suggested in the TO BE analysis are audio video recorder, video editing suite, laptops or tablets, camera, technical specialist. Cost of each equipment has been considered on the market value. Audio video recorder and video editing suite setup cost is taken for the year 2014-15 only.Here, for setups of one building is suggested for audio video recorder. The cost of each set up is calculated by adding the cost of each equipment required for the setup. An audio video recorder will have a camera for recording and a tripod to support camera. The minimum cost of camera and tripod is Rs. 5,000[10] and Rs.790 respectively and total camera and tripod required will be 14(4+4+4+2).So the overall cost will be cost of tripod is Rs.11,060 and the total cost of camera is Rs.70,000.

Total cost of audio visual suite is(11,060+70,000) Rs.81,060 which has been rounded to Rs.81,000. While, the depreciation rate of electronic equipments was calculated@60% of the cost incurred for the year, as mentioned in the depreciation of electronic equipment's, the maintenance value of audio video recorder for the year 2015-16 was Rs. 48,600 and the closing balance for the

year 2015-16 was (81,000-48,600)Rs. 32,400, this amount would be carried forwards as the opening balance for the year 2016-17 on which the depreciation rate is applied to get the maintenance cost of the year i.e., 32400@60% which stood as Rs. 19,440 respectively. Similar, calculation were done for video editing suite in which each computer equipment cost approximately Rs.37,542(Rs $600*62.75)[8] and since in video editing suite four computers are required so the total cost of computer was computes as Rs.1,50,168(Rs. 37,542 *4). Moreover, the software's required for the suite will cost approx.Rs.8157.5 [8] as per internet source, along with other equipments that would cost approx. Rs.3,137.5.Additionally, sound mixer would cost Rs. 26,130[9]. Finally, the total cost of video editing suite would be Rs.1,87,500. While, its estimated maintenance cost was calculated in the similar manner as was calculated earlier.

TABLE IIICOST STATEMENT WITH DIGITIZATION (TO BE)

(Rs. in lakh)

Particulars	2014-15	2015-16	2016-17
Salary to teaching staff	662.79	747.63	843.33
Salary to non-teaching staff	266.87	294.9	325.86
Audio video recorder	0.81	0.48	0.19
Video editing suite	1.87	1.12	0.45
Laptops or Tablets	94.5	0	0
E-book	94.05	0	0
Electricity charges	385.48	385.48	385.48
Internet and lease line expense	33.6	33.6	33.6
Salary to technical staff	18.52	18.52	18.52
Electricity charges	385.48	385.48	385.48
Maintenance of generator	2.79	2.37	2.02
Travelling allowances expenses	456.38	1264.18	3501.78
Hiring charges of vehicle/generator	19.43	15.94	13.07
Compensation of accommodation	22.64	24.23	25.92
Contingency expenses	138.93	127.82	117.59
Maintenance of furniture and fixtures	30.86	27.78	25
Maintenance of computer /vehicle/equipment's	129.31	153.88	183.12
Total	2744.31	3483.41	5861.41

It was also suggested in the study that for better access to study material the students should be provided with the laptops, & therefore the cost of each laptops was calculated on the basis number of students admitted per year, collected from the institute for the year 2013-14, 2014-15 as 700 & 520 respectively, will be incurred for only one time as maintenance of laptops will not be bear by the institute. To calculate the overall cost of laptops total number of students are required, for getting the data of number of student in the institute we requested to the institute exam cell, they provided us the data for the year 2013-14, 2014-15 i.e. 700,520 respectively.For estimating number of admission for the year 2016-17, recent last attained data was considered i.e., 520 students. The price of laptop in the market is Rs 13500[10] and therefore the total cost of laptop for the year 2014-15 is calculated as Rs. 94,50,000 i.e., 13,500*520. While, the cost of hiring & maintaining technical specialist[11] has been calculated based on the requirement of such specialist which is assessed as 1 senior specialist, 2 assistant and 4 junior technical staff. The hiring rates of different specialist have been taken as that prevailing in the market and have been extracted from internet source. The hiring rates of different level of experts have been averaged & are assumed to be same for the next three years for the sake of simplicity of calculations, thus the average salary comes out to be Rs. 22,050 for a month and for a year it comes to be Rs. 2,64,600.

Finally, the cost of e-books which is considered to be the one time cost in the study has been booked in the cost statement as per the institutes record for the year 2014-15 which was Rs 94,05,000/-.

V.FINDINGS

Analyzing, the cost statement incurred by the institute on technical head/instrument/ gadget it is clear that the cost is

continuously decreasing and clearly depicts that there is a viability of 90.4% to digitize the traditional approach.
Moreover, the Institute has to pay only for the initial set up cost for the equipment's required for digitizing an institute and for further year only 10% cost for maintenance has to borne by the institute which is quite low and can thus act as a good indication for the institute in terms of maintenance cost.

Apart from the above, other initiatives can be taken by the institution of this kind with respect to learning environment and generating revenue like instructors can utilize their free time by offering crash courses for students within and outside the institute, use pool buying power for trimming the overall cost related to study. In addition, the institutes can rent their cloud server which also act as earnings for such an institutions.

VI.CONCLUSION

The study concluded that wonders in digitization can be observed with greater impact towards development in education sector and innovation in technology. The above analysis clearly evidences, that all these learning are different from each other in terms of delivering knowledge and content to the students which can bring transition in Indian education style of learning from traditional to TECHNOSCAPE. It allows a tutor to pick a solution along a range of spectrum that meets the need of students. Thus, technology could not only mean to suite the requirement of students but also look after the teachers need so that they can help student to learn better.

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