

E-Learning and Digital Classroom Solutions in Indian Schools: A Study of Types and Variables for Effective Adoption

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Abstract—Use of technology or E-learning techniques help in delivering standardized teaching and learning in schools especially at the primary and secondary levels. E-Learning, though used widely in other countries of the world, is not easily adopted in India due to lack of internet bandwidth and a host of other infrastructure factors. The authors in this paper explore the different types of Digital Classroom Solutions for E-learning that are in vogue in schools in India and also explain the various components of ‘digital classroom solution’, a form of E-learning that has been adopted by over 30,000 private schools across the country. The paper also states the market potential available for ‘digital classrooms solutions’ and the major e-learning solution providers/organizations that are operating in India. Further it concludes with a conceptual framework of factors that determine the successful adoption of ‘digital classroom solution’ in schools.

Keywords— E-Learning, Digital Classroom Solutions, Digital Learning, Indian School Education

I. INTRODUCTION

As a country with a population of over 1.21 billion with an average age of 25 years, the need for school education in India is huge. As per the latest census of the year 2011, the population with the school going age is 354 million contributing to 29% of the population [*Indian National Census 2011*]. To meet the educational needs of this population, Government of India allocates huge budget.

India has over 1 million schools [CLSA Indian Education, 2008] that are recognized by the government. Though the government has been constantly increasing the funding for school education, the government and public schooling system has not been able to fulfill the needs of the growing population. Also thanks to the bureaucracy and the systemic inefficiency, the funds allocated do not reach the beneficiary. This results in poor infrastructure, inadequate teachers, poor enrolments and high percentage of drop outs from the government schools. Another lacuna in the government school system is their focus on vernacular language as the medium of instruction, whereas post liberalization, the aspirations of the middle and lower middle class has grown and they too would want their children to be educated in English medium schools.

This has resulted in burgeoning of private schools across the country. Though the number of schools has increased phenomenally, there are quite a few challenges and complexities that the school system in India has to encounter:

1. There are multiple boards to which the schools can affiliate themselves – CBSE/ CBSE-I/ ICSE/ State Boards. On an all India basis, there are 26 Boards of Education.
2. Another major problem is high amount of drop-outs: It has been found that 16% of students drop out of Class 1-4 and 43% Class 5-8 and 68% in Class 9-12 [CLSA Indian Education, 2008].
3. The cost of education in private schools is very high resulting in Indians spending about 9% of their income on education which is highest among the BRIC countries : the corresponding figures are 6% for China, 4% for Brazil and 2% for Russia [*Credit Suisse Emerging Consumer Survey, 2012*]
4. The varying standards of evaluation of different state boards resulting in some states always declaring a very high students’ pass percentage and some very low.
5. With the current focus on engineering and commerce courses at the graduate level, students’ qualifying with pure sciences graduation has come down drastically and hence there is a serious paucity of teachers with science/mathematics background.
6. With the economy opening up, jobs in the private sector has become very attractive with their higher salaries and hence candidates opting for teaching jobs have come down, further aggravating the problem of getting qualified teachers. This has resulted in a high teacher student ratio, the national average being 1:46, the consequence of which is poor learning outcome.

As per the *Report on the System of Education in India, 2006*, the schooling system in India is categorized as:

1. Pre-School – catering to children upto 5 years and is not mandatory
2. Primary School – for children of 6 years to 10 years: from Class 1 to 5

3. Middle School- for children of 11 to 13 years: Class 6 to 8
4. Secondary School – for children of 14 – 15 years: Class 9 to 10
5. Higher Secondary School - for children of 16 – 17 years: Class 11 to 12.

II. E LEARNING – MARKET POTENTIAL IN INDIAN SCHOOL SYSTEM

Project for International student assessment (PISA), an international survey that was conducted across 51,000 children [age: 15] from 73 countries on knowledge and skills in reading, math and science literacy, found that India scored 72nd and 73rd out of 74 in both reading and Math. In such a scenario, the only way ahead for improving the learning in Indian schools is adoption of technology enabled solutions. [Program for International Student Assessment 2012]

Globally, while overall expenditure on K-12 education – i.e. Primary/ secondary education is expected to grow from US\$ 2 trillion in 2012 to US\$ 6.3 trillion in 2017, the e-learning market is expected to grow from US\$90.9 billion to US\$255.5 billion in 2017 [Source: GSV Advisors, 2012]. Specifically, E Learning in K 12 segment is expected to grow from US\$ 16.6 Billion in 2012 to US\$ 69 Billion in 2017 growing at a CAGR of 33%. [Rajesh T, 2013]

E learning business in India is expected to grow from around US\$ 20 billion in 2013 to US\$ 40 billion in 2017. (ICT Post, 2013) The following reasons are responsible for this growth-

- Increasing internet penetration
- Present low coverage
- Growing income
- Growing population
- Emergence of global education companies like Pearson, McGraw Hill in the Indian market

While these figures are for the overall e-learning business which includes exports and higher education market, the e-learning market for K-12 segment [as in 2012] alone is pegged at around US\$ 1.4 billion which is split up as below: [NextBigwhat 2012]

- Home Tutoring and enhancement of student experience – US\$ 150 million
- Digital classroom solutions for private schools – US\$ 500 million
- Digital classroom solutions for government schools – US\$ 750 million

The private schools market for digital classroom solutions is expected to grow at a CAGR of 20% to reach US \$ 2 billion by 2020. [Knowledge @ Wharton, 2012]

III. DIGITAL CLASSROOM SOLUTIONS – INDIAN SCENARIO

The digital classroom solution space in private schools has seen intense competition in the past three years and the market is widely divided and fragmented. The following companies

with the national presence are competing for a market share, apart from a host of smaller regional players:

TABLE I
PRODUCT BRAND VS. COMPANY

Product Brand	Company
Smartclass	Educomp Solutions
Digiclass	Pearson Education
Digischool	HCL Learning
Teach Next	Next Education
SmartLearnClass	Extra Marks Education
Classteacher	Shaper Technologies
Nguru	NIIT
Class Edge	Tata Interactive Solutions

The market share of different companies of digital classroom solutions in the private schools market is shown below:

TABLE II
COMPANY VS.MARKET SHARE [INSTALLED BASE]

Name of the Company	Installed base – No. of Private Schools
Educomp	14500
Next Education	6000
HCL Learning	3000
Tata Interactive	2000
Pearson Education	2000
ExtraMarks Education	1300
Others	3000
Total	31800

Educomp has emerged as a leading company having 14,500 (46%) private schools adopting its products.

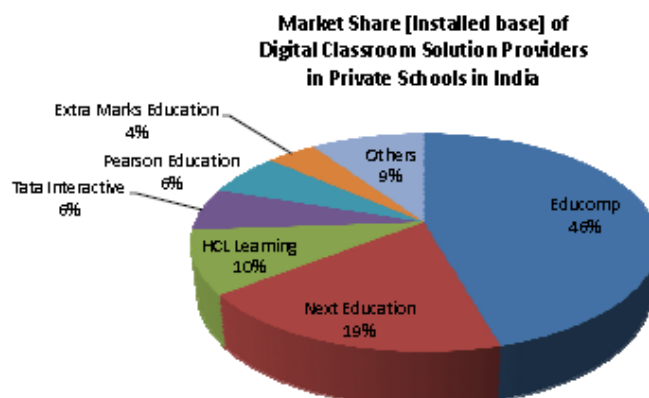


Fig. 1 Company Vs. Market Share [Installed Base] of Digital Classroom Solution Providers in India

Source: Compiled by the authors from the respective company websites

As is seen from the above table, only 37% of the private school market of 80,000 schools has been addressed by the existing players. With the growth in income and aspirations, demand for private schools is growing and accordingly the number of schools is growing at 15% annually. In addition the aided schools numbering 225,000 is another big market waiting to be tapped with cost effective solutions.

IV. TYPES OF E LEARNING & DIGITAL CLASSROOM SOLUTIONS

E learning is a broad term that can encompass different means by which information and communication technology and electronic media can be used in education. E learning can use different media such as CD ROM, TV, web based learning etc.

E learning can be categorized based on the way the learning occurs:

- Synchronous learning
 - o Instructor led learning
 - o Learning happening at the same time
 - o Participants interact with the instructor and if needed among themselves via the Web in real time
- Asynchronous learning
 - o Self paced learning
 - o Can be taken up at a time convenient to the participant and from anywhere.
 - o Content is uniform and once produced can be used repeatedly.
 - o Participants complete training without trainer facilitation

The above classification of e learning is more relevant from the corporate learning or higher education point of view. In e-learning, the teacher and students are in different locations, whereas in blended learning, classroom learning is supplemented with e learning.

The schools started adopting computer based training in 1990s with companies producing basic multimedia content in CD ROMs. The post liberalization and the IT penetration of 1990s and in this decade saw significant growth in schools adopting E learning. The past 8 years saw emergence of many private players such as Educomp Solutions, HCL, NIIT etc. in the school e learning segment. These companies adopted a blended learning method instead of adopting pure e-learning method which helped them to overcome the poor/ non availability of high speed internet.

The comparison between different types of learning is shown in the following chart:

TABLE III
TYPES OF E-LEARNING

Goal	Classroom Learning	Blended Learning	E-Learning
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Teaching Knowledge dissemination	<ul style="list-style-type: none"> • One to many teaching with physical presence 	<ul style="list-style-type: none"> • One to many teaching with the aid of multimedia contents • Interactive classrooms • Teachers create, save and re-use content • Digital library • Tools for creating Lesson Plans for teachers 	<ul style="list-style-type: none"> • On-line courses • E Books • Digital library • Online discussions • E-mail • Web conferences
Class Exercises and activities	<ul style="list-style-type: none"> • Class discussions • Face-to-face group work 	<ul style="list-style-type: none"> • Online group work • Mind-maps 	<ul style="list-style-type: none"> • Online group work • Online discussions • Chat sessions • E-mail • Assignments submitted on-line • Web conferences
Practicals/ Labs	<ul style="list-style-type: none"> • Use of models and tools • Display and demonstration in class • Practical experience in Lab 	<ul style="list-style-type: none"> • Virtual Labs • Simulation exercises 	<ul style="list-style-type: none"> • Virtual Labs • Simulation exercises • On-line assessment of lab results
Assessments & Evaluation	<ul style="list-style-type: none"> • Pen and paper tests and assignments • Live presentations • Quizzes 	<ul style="list-style-type: none"> • Tools for creating quizzes and MCQs • Hand held student response system • Question banks • Tools for Question paper preparation 	<ul style="list-style-type: none"> • On line quizzes • On line examinations

Source: Compiled by the authors

The e-learning as used in Indian schools is of asynchronous type, in which contents are pre-created and used in classrooms. This is more of traditional type which involves intense preparation of content and requires subject matter experts, instructional designers and animators to produce them. The e learning approach that is being followed in schools in India is more of 'blended learning where a teacher is present in the class and uses digital resources to support teaching.

V. DIGITAL CLASSROOM SOLUTIONS [DCS] - COMPONENTS

Digital Classroom Solutions have at its core relevant computer hardware in every classroom connected over a local area network to the server. The software or multimedia content resides in the server and can be accessed by the teachers from their classrooms. The teachers will have access rights based on the subjects they are teaching.

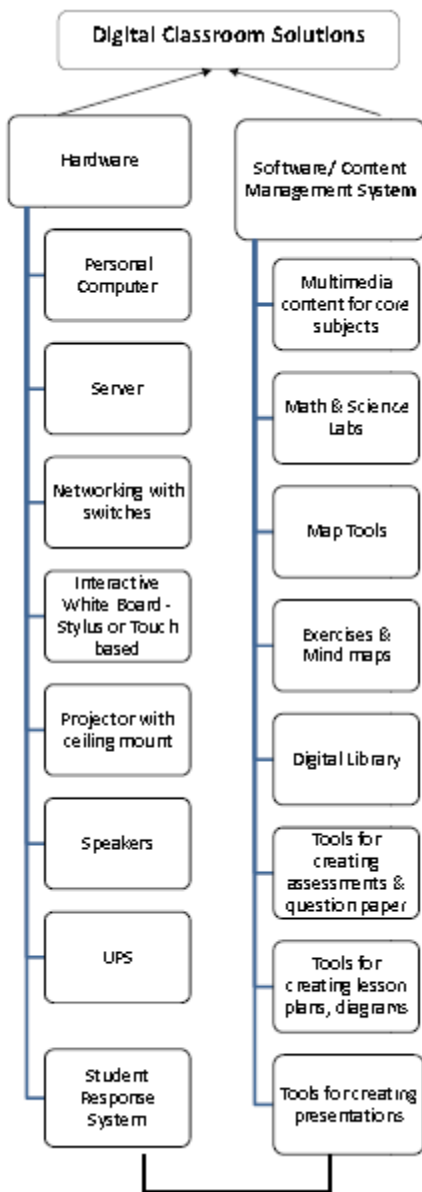


Fig. 2 Components of Digital Classroom Solution
Source: Compiled by the authors

As shown in the above flowchart, the basic components of E Learning/ Digital Classroom solutions are the Hardware and Software/ Content Management System.

A. Hardware

The hardware essentially consists of personal computer, server, network with the relevant switches, interactive white board that enables teachers to create and save content, projector with the ceiling mount, speakers, ups and based on need can also include hand held student response system with a teacher console.

B. Software/ Content Management System

The Software consists of multimedia content for languages, mathematics, science, social studies, and computers etc., tools for math and science lab, tools for maps,

interactive general knowledge tools, exercises and mind maps, digital library, tools for creating lesson plans, assessments, MCQs, question papers, diagrams and presentations.

VI. ADOPTION OF DIGITAL CLASSROOM SOLUTIONS

The adoption of DCS in Indian private schools adds value to the teaching and learning process. It improves the teaching as well as learning more competent because the Digital Classroom Solutions can provide:

- A viable alternative to rote learning that is practiced across schools in India.
- Learning beyond text books
- More practical way of understanding abstract concepts
- Improved teacher productivity
- Platform for teachers to create content on their own and also to collaborate amongst them
- Tools for creating lesson plans, quizzes and question banks
- Objective assessment

A. Variables Responsible For Effective Adoption of Digital Classroom Solutions In Private Schools:

The authors conducted an empirical survey of 60 private schools based in the city of Bangalore who have adopted Digital Classroom Solutions. The questionnaire was designed to explore the variables responsible for effective adoption of DCS. Based on the survey findings, the following variables were identified as most crucial for adopting DCS by schools:

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- 1) Variables relating to principal/ head of institution for implementation of DCS process
 - a) Ensuring continuous usage of solution
 - b) Hardware problems and trouble shooting
 - c) Imported hardware – especially projectors and interactive white boards are not suited for the hot and dusty condition in Indian schools
- 2) Variables related to parents for awareness and effectiveness on knowledge enhancement
 - a) Acceptance by parents with regard to the effectiveness of the solution with respect to increased learning outcome
 - b) Acceptance by parents to pay the incremental fees
- 3) Variables relating to teachers/ curriculum for effective delivery of curriculum through DCS

- a) Resistance from teachers due to the perception that technology will make them redundant
 - b) Fear of teachers on using technology
 - c) Content customized to different boards/ curriculum
 - d) Changes in Curriculum
 - e) Requirement of localized content including content in vernacular language
- 4) *Variables related to students for effective learning through DCS*
- a) Ease of understanding the concepts
 - b) Neutral language
 - c) Content that excites and makes learning interesting
 - d) Ensure participative and collaborative learning
- 5) *Variables related to management for effective adoption of DCS*
- a) Cost of technology, especially affordability and willingness to invest
 - b) Infrastructure, especially availability of uninterrupted power is a problem in most parts of the country
 - c) Availability of internet bandwidth, especially in semi urban and rural areas

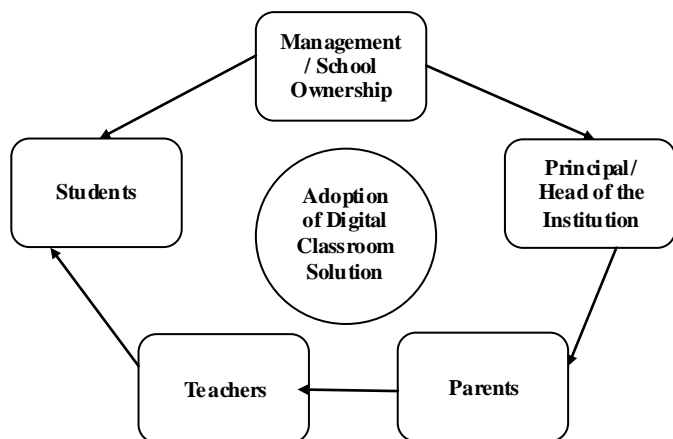


Fig. 3 DCS Adoption process in Indian Schools

The ward is at the core of Digital Classroom Solution since it is he/ she who is the ultimate beneficiary of the solution. However for effective adoption, the other stake holders in the school eco-system viz., the management, head of the institution, teachers and parents play a key role.

The DCS service providers over the years have addressed the above variables through their solutions. However, the solutions that are offered by the different DCS service providers may vary in its approach and impact Vis-a-Vis different stake holders. The variables and the solutions being implemented by DCS service providers are as below:

TABLE IV
EFFECTIVE ADOPTION OF DIGITAL CLASSROOM SOLUTIONS:
VARIABLES VS. SOLUTIONS

S No.	Variables responsible for effective adoption of DCS	Solutions being implemented by Companies
Principal/ Head of the Institution related		
1	Ensuring continuous usage of solution	Companies have incorporated tools to measure/ monitor usage of digital classroom solutions and tools.
2	Hardware problems and trouble shooting	Companies provide Resource Coordinators, especially in schools that have large number of classrooms equipped with digital classroom solutions.
3	Imported hardware – especially projectors and interactive white boards are not suited for the hot and dusty condition in Indian schools	Preventive maintenance checks and training for the school staff on simple upkeep helps to mitigate this problem
Parents related		
4	Acceptance by parents with regard to the effectiveness of the solution with respect to increased learning outcome	Companies normally address the parents and demonstrate the solutions during PTA and impress upon the higher learning outcome of the children
5	Acceptance by parents to pay the incremental fees	
Teachers/ Curriculum related		
6	Resistance from teachers due to the perception that technology will make them redundant	Companies routinely sensitise the teachers on the fact that the technology is only supplementing their teaching
7	Fear of teachers on using technology	Regular teacher training is provided by companies on hardware, multimedia content and tools available
8	Content customized to different boards/ curriculum	Though most of the companies create content for CBSE, they map it to ICSE and other State Boards
9	Changes in Curriculum	Companies keep updating the content with respect to changes in curriculum
10	Requirement of localized content including content in vernacular language	Most of the companies offer content in Hindi and a few have started offering content in vernacular languages also.
Management related		
11	Cost of technology, especially affordability and willingness to invest	Companies have been offering the hardware with the content on 5 year lease/ hire purchase model
12	Infrastructure, especially availability of uninterrupted power is a problem in most parts of the country	Though UPS is provided by companies, the challenge still remains since UPS gives only 15-30 minutes back up whereas power shut down in some areas of the country are upwards of 2 hours
13	Availability of internet bandwidth, especially in semi urban and rural areas	Most of the companies have overcome this problem by providing server based content.

VII. CONCLUSION

The private schools in India are facing acute shortage of good teachers. The schools have to compromise and manage with teachers of varying quality and standards. In the

backdrop of declining standards of teaching, e-learning and digital classroom solutions can help in ensuring effective knowledge delivery to students. Increasingly schools across the country have been adopting e-learning/ digital classroom solutions as a method to supplement the efforts of the teachers and ensure effective learning.

To conclude, digital classroom solutions help create an environment which is learner centric rather than teacher centric. This will result in creating and sustaining the interest among children and will ensure their active participation and engagement in learning, which in turn will create empowered and knowledge centric future citizens.

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