MAIT

EduVision 2018

Transforming Education Through Technology Adoption

In Association with

DELL Microsoft hp

From The President's Desk

With a vision to empower schools, MAIT, in 2015, laid the foundation of EduVision by focusing on 'Developing Employability through IT Powered Education in the 21st century'. The aim behind this report was to highlight the pressing need to have IT empowered education, in order to equip students with industry ready skills and knowledge.

We, at MAIT, believe that the four most important and indispensable elements of ICT enabled classrooms are hardware, content, internet connectivity and power. Basis our understanding, very few schools in India have all the four elements that are essential to having a functioning and effective ICT enabled classroom. India needs to consciously move towards techno-driven classrooms that promote access, quality, and affordability. India ranks 91 on the 'Networked Readiness Index (NRI), 2016', a key component of the World Economic Forum's 'Global Information Technology Report, 2016', which examines the role of ICT in driving innovation.

Despite the Government formulating policies and dedicating funds to ensure adoption of IT enabled classrooms at the school level, the impact and outcome remain largely wanting. We understand that the challenge is not that of willingness, but that of last mile implementation of all the four elements respectively. Having infrastructure in place is but the first step; it's equally important to have learning solutions, focused capacity building efforts, and robust feedback loop in place.

It is to achieve this purpose that EduVision 2018 was conceived. The report analyses gaps in the current education landscape and offers recommendations considering the various elements of the education ecosystem. We hope you enjoy reading this report.

Warm Regards,
Nitin Kunkolienker
President, MAIT

From The Vice President's Desk

India is one of the world's largest growing economies today. We recognise that our growth is directly correlated to the empowerment and development of our people. Against this backdrop, the Government of India launched 'Digital India' in 2015, to digitally empower every citizen.

Education is perhaps the most important cornerstone of this digital transformation and in order to prepare for this wave of change, building digital skills is as essential as creating digital infrastructure. A recent report by the Digital Empowerment Foundation indicates that 30% of our population lags on basic literacy and thrice that for digital literacy. For a generation that will be exposed to an increasingly digital and connected world, their familiarity with technology and reliance on Information and Communications Technology (ICT) will determine how they work, entertain, collaborate, consume and most importantly, create.

To nurture this future digital citizen of India, we will have to start democratising use of technology in education, right from the formative years. Their early touchpoints, namely; parents, teachers, and institutions will have to evolve, to spark curiosity and provide avenues for embracing digital literacy.

The role of ICT in this scenario would be to empower the ecosystem and ensure that technology creates a levelling field to provide consistent quality to every student. With this vision, MAIT initiated EduVision in 2015, wherein the focus was on how to improve the delivery of education across touchpoints.

With EduVision 2018, we have expanded this scope; the document focuses on strengthening the good work that has already been undertaken, identifying existing gaps and addressing them via tech-immersion. A sincere and deliberate effort has been made to keep education players and the ecosystem at the heart of all recommendations.

Skilling and innovation are not only the outcome of education, but also the throughput. We need to equip our teachers, parents, and school administrators with the knowledge of how ICT can make their delivery more effective, measurable and efficient. This would be an important pivot on which skills for the future can be developed.

On behalf of MAIT, I am grateful to all our expert group members and advisors, who not only invested their precious time but also their passionate effort, in creating this document. Your recommendations and constant guidance has helped us forge this platform.

Sincerely,
P. Krishnakumar
Vice President, MAIT
SVP and GM, Asia Pacific and Japan - Dell

Foreword

India is a land of 1.3 billion minds. We also enjoy a demographic dividend that is the envy of many nations. Unity in diversity is amongst our biggest strengths. As per the World Economic Forum, India is one of the most multi-lingual countries, with sixteen official languages. When we draw a correlation with countries that have ahead-of-the-curve Human Development Indices, the number of preferred languages falls to below five. What does this mean for Education?

Many research studies prove, that learning in one's mother tongue aids in better grasping and understanding of the concept. If you compare the sheer number of languages and dialects in India, the number will leave you spellbound. Up until the advent of Artificial Intelligence and Machine Learning, the effort to customise learning material and pedagogy to various languages would have seemed a Herculean, may be even an unattainable task. If we consider the pace at which the world is evolving, this would have continued to seem daunting.

Technology is however a great leveler and a necessary enabler. The last few years have seen how India has progressed by leaps and bounds on expanding access to education for every child. Our next milestone, therefore, is to offer access to 'quality' education across schools, districts, cities, and states. As a country with the world's largest youth population, there are numerous threats about the magnitude of jobs we may lose to emerging technology. The only way we can embark on this challenge is to truly become a digital and knowledge economy, where we play a part in creating these disruptions, rather than just consuming them. We need to ensure our educational systems create a problem solving, innovative, entrepreneurial mindset in the students, which will spur thousands of new 'job creators' instead of just 'job seekers'.

Fostering innovation and the spirit to unlearn and relearn will be at the heart of this transformation. For this, the entire ecosystem of education will have to be considered: students, teachers, administrators and policy makers are all important stakeholders of this equation. Many disruptive innovation initiatives, including Atal Innovation Mission's Tinkering labs are initial steps in this direction. We need to look at many more.

EduVision 2018 is an attempt to explore ways of how technology can transform education, by supporting and focusing on various elements that create a larger learning and development ecosystem. Creating a platform for an objective and well-meaning discussion is just the first step in achieving a larger change. I congratulate MAIT on this initiative, and wish MAIT and its members, success in taking this forward.

Sincerely,

R. Ramanan

Mission Director, Atal Innovation Mission

Additional Secretary, NITI Aayog

Preface

India is a country on the move, where rapid economic growth and inclusive development programmes have powered the rise of its 1.3 billion citizens and placed renewed focus on developing a world-class education system. Indeed, with more than 50% of India's population under the age of 25, Government officials recognise that sustained investments in education are vital to promote India's long-term growth & development and equip students with 21st century skills that are required for their success in the global workforce.

Today, India has one of the largest education systems in the world, with an estimated 285.5 million students enroled in more than 1.6 million primary and secondary schools, and 29.6 million enroled in more than 48,000 institutes of higher education. The Indian Government however, still faces several daunting challenges as it looks to provide universal and high-quality education across the country. According to a 2014 UNESCO report, nearly 26% of India's population remains illiterate, and the World Bank estimates that while more than 95% of Indian children attend primary school, only 40% go on to pursue secondary education. Despite significant Government and private-sector investments in education, learning outcomes have stagnated in recent years, and secondary school dropout rates hang over 17%, according to the Lok Sabha.

Against this backdrop, the Government is advancing an ambitious set of reforms under the Digital India initiative to catalyse the growth of India's digital economy and bridge digital divides. As New Delhi looks to build on its progress to date - encouraging students, teachers, and administrators to leverage Information and Communications Technology (ICT) tools inside and outside the classroom is critical to improving learning outcomes.

To support these initiatives, MAIT has prepared the following report exploring opportunities to deploy technology in Indian schools, with the goal of making education more inclusive, by reducing access and cost barriers; ensuring quality curriculum delivery; effectively monitoring learning outcomes; and empowering teachers to deploy corrective measures when needed.

EduVision 2018

Transforming Education Through Technology Adoption

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Executive Summary

Status of ICT in Education

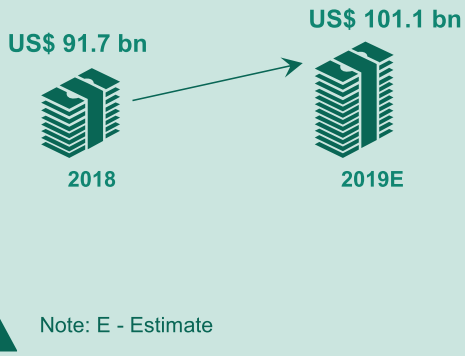
Since the introduction of Information and Communication Technology (ICT) hardware in schools in 1985, India has progressed rapidly, bringing in new technologies into the classrooms. There is a noticeable transition from the use of chalk and blackboards, to laptops and tablets. Flagship programmes like the Rashtriya Madhyamik Shiksha Abhiyan supported the growth of 85,127 ICT enabled schools through 2015 and generated momentum for the Government's current focus on cultivating digital literacy. Today, India's National Policy of ICT in School Education underscores the Government's commitment to providing universal, equitable access to state-of-the-art-tools to students and teachers. Additionally, the Government has also launched ambitious plans to provide ICT training to 5.25 million people through the Digital Saksharta Adhiyan (DISHA) programme, and hopes to advance digitisation initiatives by introducing e-Governance in the Ministry of Electronics and Information Technology (MeitY) through its Digital India Programme.

India offers a great opportunity to implement ICT in education-with approximately 29% of India's population being between the age group of 0-14 years. The education sector is estimated at US$ 91.7 billion in FY18 and is expected to reach US$ 101.1 billion in FY19.

India has over 250 million school going students, more than any other country. It also has one of the largest networks of higher education institutions in the world. Number of colleges and universities in India reached 39,050 and 903, respectively in 2017-18. India had 36.64 million students enroled in higher education in 2017-18. Gross Enrolment Ratio in higher education reached 25.8% in 2017- 18.

Indian Education Sector

Market Size

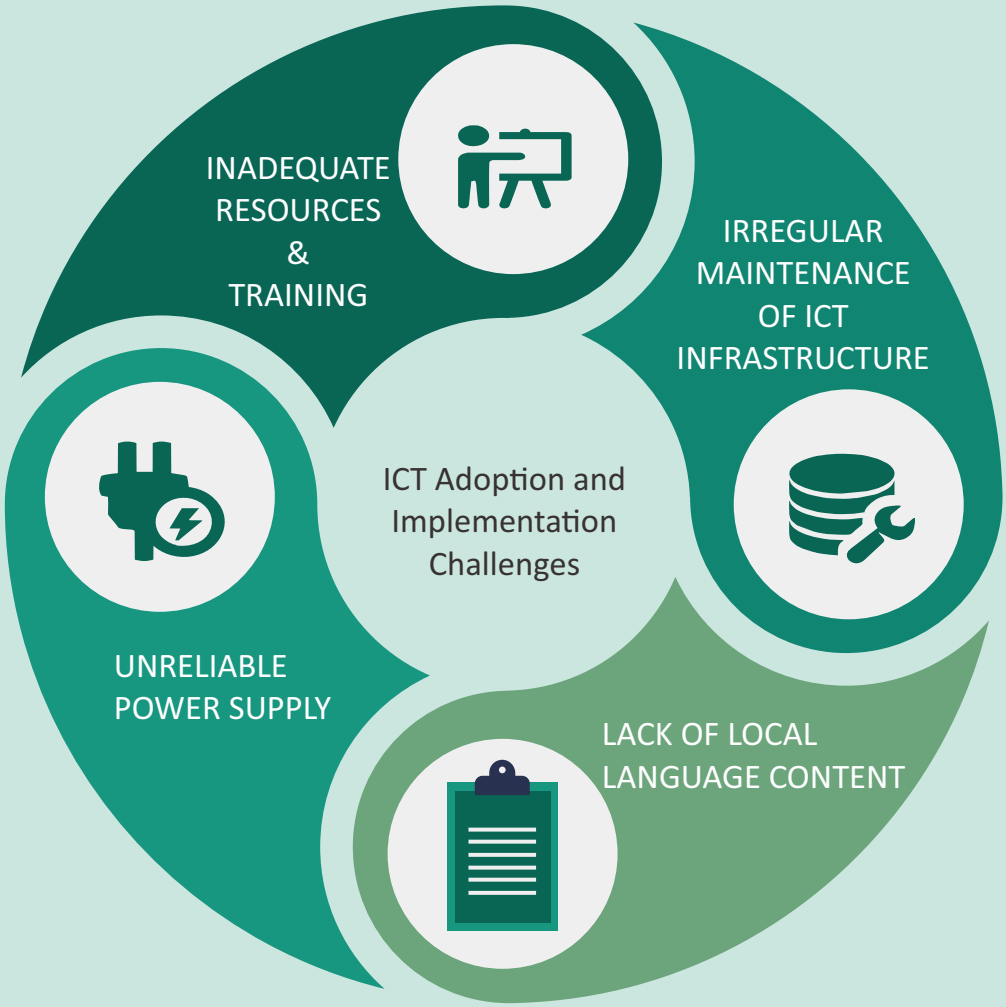


Note: E - Estimate

Source - IBEF

Challenges

Despite these promising efforts, India continues to face an array of obstacles that have limited the successful adoption and implementation of ICT in schools. Notably, uneven access to reliable sources of electricity places constraints on schools looking to deploy computers. Even schools that already have computer infrastructure, often lack the resources and training to provide regular maintenance, yielding limited benefits for students and promoting unsustainable use habits. As students encounter computers for the first time, limited availability of local language content creates steep learning curves that obscure the computers' transformative potential.



Converting Obstacles into Opportunities

To identify new and high-impact opportunities, MAIT convened a committee of education and technology experts from industry, civil society, academia, and public sector to prepare a detailed report - EduVision 2018 (the list of experts is outlined in ANNEXURE I).

The committee identified the following as key areas where ICT could be leveraged to improve education outcomes in schools:

(1) Capacity Building

(2) e-Content

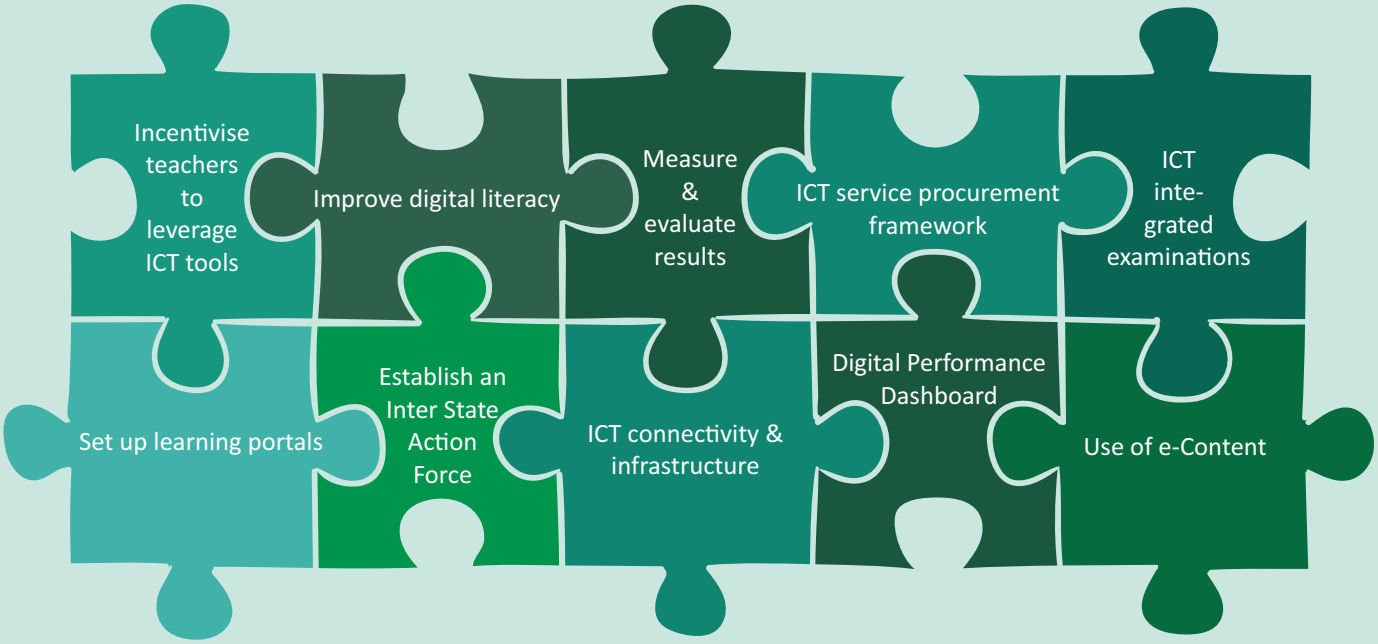
(3) ICT Infrastructure

(4) Research & Innovation

(5) Monitoring, Evaluation and Assessment

EduVision 2018, analyses gaps in the current education landscape, offers policy recommendations for the National Policy on Education aimed at improving education access and quality through ICT interventions, and provides recommended guidelines for corporate social responsibility investments in education.

Recommendations:



The following are the TEN key recommendations made under EduVision 2018:

1. State and Central Government officials should encourage schools to incorporate technology into classrooms, in order to enhance the quality of teaching and provide students access to more engaging, diverse and modern online learning materials.
2. Teachers should leverage ICT tools to connect local education ecosystems to real world experts and incorporate proven methods of engaging students to advance learning outcomes. Basis the usage of ICT tools, teachers and schools should be awarded a 'Certification of Achievement' from the Ministry of Human Resource Development under the National Award to Teachers.
3. Educators must receive training on online modules / online training to improve their digital literacy and to encourage the development and use of e-Content.
4. ICT tools need to be used to measure & evaluate student learning outcomes and teacher performance. This will empower teachers to deploy interventions as necessary and improve the national policy decision-making process, by providing accurate local data.
5. A framework for ICT services procurement should be developed in collaboration with industry stakeholders, which prioritises affordability, usability, ease of maintenance & feasibility of upgrades to avoid technology obsolescence and e-Waste recycling.
6. Policymakers should enable the provision of ICT-integrated examinations and e-Governance at the institutional and systemic level, including setting up of education portals.
7. The Government must encourage regional networks of collaboration among states, to promote educational quality and equality, to meaningfully bridge the digital divide between states. An Inter State Action Force may be established for smooth dialogue and implementation.
8. The Government needs to focus on ICT connectivity, basic ICT infrastructure and accessibility, through partnerships with the private sector and civil society.
9. Develop a digital performance dashboard with data visualisation that is available in the public domain, for effective monitoring & assessment of the overall implementation and its outcomes.
10. The Government's vision and ability to take large scale action, the inherent DNA of corporates to innovate and leapfrog development, academia's astute focus on research & need analysis, and the civil society's ability to amass reach and expertise, all must be brought together to create perceptible difference in the evolution of education in India.

Capacity Building

Strengthening Skills & Competencies for Students, Teachers, Administrators and Parents

Catalysing the growth of India's education system requires further investments in capacity building for students, teachers and administrators. Rigid and outdated curricula, ineffective teaching methods, and rising disconnect between educational training and industry requirements, all hinder student learning. To add to this, school curricula tends to under-emphasise the importance of communication skills, creativity, technological expertise and problem-solving skills that students need, in order to face future challenges.

India has fallen behind in developing its students as a competent workforce, to fulfil the demand for skilled workers. Despite completing their education, students are unable to find employment without the necessary skills required to be employed in the respective sectors and this unpreparedness has led to some serious ramifications, even in the elite fields.

Today, nearly 90% of job opportunities require vocational skills, yet only 5% of India's young people enrol in any type of vocational training or coursework.

According to a report by job skills assessment company, Aspiring Minds, only 20% of Indian engineering graduates are able to find employment.

ICT can be used for administrative processes, and also for pedagogical processes and delivery. New & existing technologies offer educators vital tools to craft engaging and personalised lessons, by leveraging multi-media platforms to foster dynamic learning experiences.

However, the promise of ICT tools cannot be realised if teachers lack the requisite skills to deploy them. As such, it is critical to ensure that teachers receive adequate ICT training, undergo continuous evaluation and are involved in digital content creation.

The ICT@Schools Policy articulates mandatory, annual Induction Trainings and Refresher Courses for teachers, led by the Regional Institutes of Education of the NCERT, State Councils of Educational Research and Training (SCERTs), and other public institutions. Teachers must undergo evaluations to ensure that they have achieved a minimum threshold of competency in using ICT tools within the classroom. To improve curricula, teachers need to be empowered to create digital content for their students, which will allow them to customise their lesson plans and assess the efficacy of in-class lessons.

School administrators should also be empowered to monitor and assess the performance of teachers and students using ICT tools, as a way to make informed assessments, gauge the effectiveness of different content delivery mechanisms and identify gaps in student learning outcomes.

Recommendations:

1. Capacity Building of Students:

1.1 Minimum contact hours between ICT tools and students at various levels should be established by the National Policy on Education (NPE).

1.2 Augmented learning techniques to facilitate greater understanding of the curriculum should be deployed by stimulating discovery and learning in schools.

1.3 NPE to encourage greater industry-academia think-tank partnerships that aim to increase the presence of ICT in classrooms, as a tool for better learning. In order to encourage creativity and impart students with greater vocational skills, pedagogical focus must shift from devices for content consumption, to those for content creation.

1.4 Study immersion tours to educational institutions across state educational boards would provide the students, teachers and administrators with enhanced exposure. Classrooms in different states could gain insights on technology adoption from each other.

2. Capacity Building of Teachers:

2.1. Encourage and train teachers to leverage ICT and create content for their individual classrooms, by equipping them with necessary content creation devices.

2.2. NPE (in consultation with the academia and industry), should set broad guidelines for the creation of a uniform and high-quality, teacher capacity building programme.

2.3. The Central Teacher Eligibility Test must include annual assessments of teachers' aptitude in technology adoption and ICT-enabled teaching delivery.

2.4. Bachelor of Education (B.Ed) and Diploma in Education (D.Ed) curricula need to provide more practical ICT intervention training, as also the curricula in Teacher Training Institutes. The training should be followed by performance evaluation by school administrations and reinforced through peer-to-peer learning, among teachers and education boards.

2.5. Adequate professional development and training must be given to teachers, enabling them to develop and deploy original e-Content in classrooms. The existing Common Service Centres (CSCs) eco-system can be leveraged for the purpose of training.

2.6. To promote peer learning and coaching across the country, delegation visits of teachers from one state to another could be organised.

2.7. Establish a teacher-community technology platform for sharing information on good practices adopted, as well as challenges faced. This could be included in the SWAYAM portal of Ministery of Human Resource & Development (MHRD), GoI.

2.8. A twinning programme, where progressive schools help nearby schools in adopting best practices in teacher capacity building, should be established across clusters of schools. Schools shortlisted under the Atal Innovation Mission could be the catalysts in bringing about this change. The School Maturity Model (detailed later in the report), can be used to map progressive schools with those that need handholding.

3. Capacity Building of Administrators:

3.1. ICT tools to monitor student-learning outcomes must be deployed by school administrators to evaluate the success of teaching methods. An ICT dashboard could be created.

3.2. ICT hardware sensitisation training for school administrators should be organised at a district level to improve digital literacy and increase teacher-student performance monitoring capacity.

3.3. Administrative Training Institutes in every State should include a module to create awareness among the administrative officers at District Level about the importance and necessity of ICT in education. A specific module on 'ICT in Education' needs to be included at the LBS National Academy of Administration, Mussoorie.

4. Capacity Building of Parents:

4.1. Offline factors regarding gender stereotype often impact digital accessibility. In India, access to technology, especially PCs and mobiles, is looked at warily particularly when it comes to the girl child. Technophobia is built on the social construct that giving 'freedom to mobile and PCs will negatively influence children. Considering

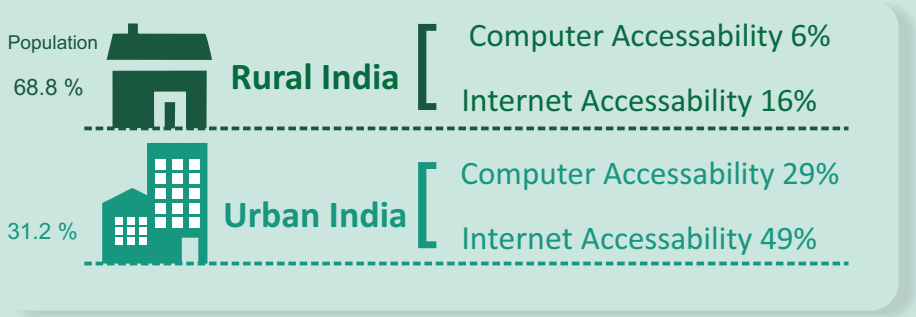
this, a special module aimed at parent training should be developed to create awareness about the benefits of technology exposure. Schools should be tasked with driving this orientation.

4.2. In a typical Indian family set-up, a mother is said to have a larger influence in a child's life. Therefore, a special awareness and training programme designed for mothers would help in taking the first step in eradicating technophobia.

Case Studies:

Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA)

The Government approved the Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) in February, 2017 to usher in digital literacy in rural India by covering 6 crore rural households (one person per household) by 31st March, 2019. The total outlay of the Scheme is approximately Rs. 2,351.38 crores.



SOURCE - 71ST NSSO SURVEY ON EDUCATION IN 2014

The PMGDISHA scheme has empowered citizens in rural areas by training them to operate computers, digital access devices (like tablets, smart phones etc.), send and receive e-mails, browse the internet, access Government services, undertake digital payments etc., and actively participate in the process of nation building. The Scheme has contributed significantly towards bridging the digital divide, specifically targeting the rural population, including the marginalised sections of society like Scheduled Castes (SC) / Scheduled Tribes (ST), minorities, Below Poverty Line (BPL), women and differently-abled persons.

For the implementation of the scheme, CSCs equipped with computers, webcam, biometric finger print scanners, iris scanner, internet connectivity and power backup, serve as training centres for a batch of around 250-300 people at a given point in time. As of November 15, 2018, over 1.52 crore candidates have been registered and trained, out of which more than 80.12 lakh candidates have been duly certified.

There are 1.41 Lakh training centres affiliated to PMGDISHA (CSC e-Governance Services India Ltd.), providing digital literacy training to citizens. These CSCs and training centres collaborate with more than 620 training partners to create a channel for the physical delivery of digital literacy training. 50 % of these are managed and operated by women and each CSC on an average employs 4 to 5 persons .[1]

Teacher Capacity Building Initiative, Dell Aarambh

The Dell Aarambh programme was founded on the understanding that exposure to interactive learning methods during the developmental years – most easily delivered by using a PC –contributes to the well-rounded growth of a student. The Dell Aarambh programme focuses on enabling both parents and teachers – who are key influencers in a child's formative years – to actively aid in early educational development by using a PC to create an encompassing ecosystem and supportive background for the child. Through this initiative, the programme has engaged close to 1.5 million students and aims to reach 100,000 teachers from over 5000 schools, across 70 cities in its first phase.

The Teacher Capacity Building Initiative undertaken by Dell in 'Dell Aarambh' programme provides focused attention on the individuals who will leverage technology to advance early childhood education. In-class training is conducted through interactive audio and video content from Edurite™, a division of Pearson India Education Services Pvt. Ltd. The curriculum not only teaches educators how to use the hardware, but also gives participants access to educational content, which can be used to supplement their lesson plans. The programme also provides a certification from Dell & NIIT. The Dell Aarambh programme was selected by the UNDP for its alignment with UN sustainable development Goal 4 – Quality Education. Through this programme, Dell is working to promote an inclusive & equitable education and lifelong learning opportunities for all.

[1]As on October 2017 -
http://digitalindia.gov.in/writereaddata/files/PMGDISHA_Ministrial%20Conclave%20Revised.pdf

Intel Teach to the Future

Intel Teach to the Future was a worldwide education programme created for teachers to help them effectively integrate technology in the classroom to enhance student learning. In India, the programme started in Karnataka and trained one teacher from each of the Mahiti Sindhu schools as Master Trainers for a period of 13 days. These Master trainers then trained other teachers in their schools. Under the programme, 8,000 teachers and head teachers from 1,000 Mahiti Sindhu schools and 400 teachers and head teachers from 76 higher primary schools were trained. While the programme has been discontinued, the 'Train the Trainer' proved to be an effective model and could be used to incentivise teachers to coach their peers and expand the reach of capacity building efforts.

e-Content

Offering flexibility of time, place and pace of learning

Image Courtesy : Dell India

Online learning in the form of e-Content can help address some of India's most pressing educational challenges - access and effectiveness. Teachers need to be empowered to create and deploy innovative e-Content in classrooms, tailored to the students' environment and ability. This will result in marked improvement of learning outcomes and also get students ready for an increasingly connected world.

Blended Learning Content: Well-curated e-Content inspires teachers to be creative, as well as students - who feel more in charge of their own learning. Often containing short videos, teachers can spend time on the introduction of the topic and dissemination of key points, while students can reflect on what they have seen. All e-Content should have W3G[2] features incorporated, so that it is compliant for people with disability. The portability of computers and computing devices have blurred the traditional lines between formal and informal learning, giving students the flexibility to learn at their own speed through self-paced trainings in Anytime Learning online modules. Learning assessments in ATL modules reinforce the information and warrant student engagement.

e-Content Infrastructure: e-Content has to be engaging and user-friendly. e-Content platforms equipped with LMTP (Lesson, Module, Topic, Page) are often preferred to video-based content, as they factor in the attention span of students and allow for deeper classroom engagement. In addition, using easily accessible Windows and Android-based classroom infrastructure such as a Stick PC with wireless keyboard and mouse can simplify e-learning modules.

Teacher Training and Monitoring: Ideally, B.Ed. and D.Ed. curricula should equip teachers with the required skills to implement ICT interventions in classrooms, investing in their ongoing professional development with frequent checks and assessments. As teachers gain familiarity with ICT tools and strong peer networks, they tend to practice more 'constructivist' pedagogies and get encouraged to become content creators.

It is important to monitor and track teacher effectiveness and student learning outcomes, especially when using blended learning methods, which combine e-Content digital media tools with traditional instructional methods. Both classroom and self-paced online components of blended learning must be tracked and assessed, to ensure success. Computer Aided Learning (CAL) sessions need to be conducted to help teachers track class performance in various online assessments. These tools are essential components of a complete lesson plan for effective CAL experiences.

In this dynamic and evolving educational landscape, it is important to promote edu-tech start-ups, which can contribute to creating quality and innovative educational solutions. A step forward in this direction is the recent move by the Supreme Court seeking a feasibility report on implementing the 'One Nation One Curriculum' Policy, that was earlier dismissed by the Supreme Court in 2017. The policy, if implemented, would promote greater alignment between school curriculum and skill development, & students across the country would have access to quality education on a level playing field - which in turn would increase their employability, nation-wide. It is vital that along with such a policy, emphasis is laid on advocating academic integrity, intellectual property rights, copyright and originality. Both teachers and students should also be exposed to fair use guidelines.

[2]W3G content is compliant for people with disabilities

Recommendations:

1. Content Creation:

1.1. Equip e-Content platforms with features that enable teachers to add supplementary content and reference materials under their individual logins. Teachers should also be allowed to add new content and references such as Massive Open Online Course (MOOC) links, YouTube links, PowerPoint slide decks, Word documents and PDFs, appropriately-tailored for the subject and grade level.

1.2. A repository of existing content must be created as a ready reckoner for teachers to refer to. Usage of platforms like TeacherTube.com, SlideShare, Khan Academy, etc., should be promoted by the school administration.

1.3. Online content providers should be encouraged to link their solutions, and free online courses on the SWAYAM platform, if they ensure periodic assessment of content structure and operational details (active links, relevant content, security assessments, etc.).

1.4. Ministry of Human Resource Development (MHRD), under its National Mission on Education through Information and Communication Technology (NMEICT) has initiated the National Digital Library of India (NDL India) pilot project, to develop a framework of virtual repository of learning resources with a single-window search facility. The Government should actively explore a way to provide K12 content that is being followed by schools, on NDL India.

1.5. In order to provide quality ICT education up to the last mile, it is imperative that all e-Content is also available in regional languages. Entrepreneurs can be called in to explore this area to overcome the dearth of vernacular content. The same can be done for non-STEM content (there is ample interactive and multi-media content available for Math and Science, but not for the other subjects). There is a huge opportunity for the Government to design incubation centres to promote entrepreneurship in the area of e-Content creation.

2. Blended Learning Content:

2.1. Blended learning methods combining digital media and traditional classroom methods should be utilised in the formal and non-formal education programmes. For example, in the flipped classroom model, short video lectures can be assigned as homework, while classroom hours are devoted to exercises, projects or discussions. Similarly, game-based content could be included in the e-Content platform. Again, e-Content should be delivered as per the medium of the school for both On Screen Text (OST) and Voice Over (VO), along with a written transcript.

2.2. Adaptive Learning is an option to be explored, where student performance is analysed in real time, and teaching methods are accordingly modified.

2.3. e-Content should be made platform-agnostic so that regardless of the device used by the learner or educator, content delivery is consistent.

2.4. e-Content should contain short videos to address the brief attention span of children in the classroom and evaluate knowledge retention through assessments.

3. e-Content Infrastructure:

3.1. e-Content platforms should be provided on simple Windows or Android-based infrastructure and come equipped with features that will empower teachers to drive CAL sessions, in order to track academic progress in the classroom.

3.2. SWAYAM can be a platform that facilitates courses for using e-Content for teachers as well as students. SWAYAM, an initiative taken by the Government, has hundreds of courses available virtually and a student can remotely access the same, free of charge. This will promote the use of e-Content not only in schools but also in the comfortable and familiar environment of home.

Case Studies:

Teacher Education in Sub-Saharan Africa

TESSA is a network of teachers and teacher educators stretching across Sub-Saharan Africa. At the heart of the network, is a bank of Open Educational Resources (OER) linked to the school curriculum, and designed to support teachers and teacher educators in developing active approaches to learning. The network is co-ordinated by The Open University, UK.

Impact of the use of TESSA resources:

- Reduced technophobia that challenges college faculty and teacher candidates in universities and colleges
- Created a platform for more teachers to learn how to use computers and accessories in their practice
- Increased the content and methodology knowledge of the users

Bangladesh-UNDP Teachers Platform[3]

The Access to Information Programme (a2i) at the Prime Minister's Office has taken several initiatives to improve access to quality education and training. One of the biggest successes in this regard is the development of an online platform - the Teachers' Portal (www.teachers.gov.bd) - for the teachers of primary and secondary level. With this, more than 1,27,000 teachers from all over Bangladesh can upload, share & collect multimedia content and share their ideas through blogs & comments. The a2i programme has brought positive changes in the education system of Bangladesh with more than 30,000+ multimedia classrooms in secondary schools, 50,000+ at the primary level and more in the pipeline. Taking this success one step further, the Directorate of Primary Education and Directorate of Secondary and Higher Education has trained more than 1,50,000 teachers through its 'Teacher-led Digital Content Development' programme, where the teachers learnt to develop and present digital contents for their classrooms, using materials found on the internet and simple presentation software. Teachers upload content onto the teachers' portal so that those from the remotest corners of the country can gain access and use multimedia contents in their classroom. More than 1054 uploads were made by the teachers and many have been conferred with leadership awards in appreciation of their efforts.

Microsoft Educator's Network

In order to facilitate innovation, it is important to provide educators with an online platform to collaborate in the creation of modules that can be shared as best practices globally. The Microsoft Educator Network, now known as Microsoft Educator's Community is the biggest online platform that hosts 4 million+ active educators from 111 countries, who share classroom best curriculum, practices, and views. The online content, is designed for educators by educators, who need to be up-to-date to meet their ever-growing teaching needs. The platform provides opportunities for professional development with specially designed curriculum such as 'Teaching with Technology (TwT)', that helps educators understand how ICT can enhance their teaching and learning experience. It also allows educators to constantly assess their learnings and skills through Certified Programmes. Teachers using the platform can create and share short, handy videos that are designed to demonstrate ways to save time and teach more efficiently with technology. The platform also has a feature through which teachers can arrange skype guest lectures for their students and host digital events such as hackathons that empower the educator community to incorporate new ideas and tools into the classroom, enhancing student experience.

[3]http://www.bd.undp.org/content/bangladesh/en/home/presscenter/articles/2016/10/04/world-teachers-day-and-teachers-conference-2016.html (Accessed 30 August 2018)

ICT Infrastructure

Roadmap to Develop a Sustainable and Inclusive Digital Ecosystem

Image Courtesy : Dell India

While the Government's Digital India initiative and India's National Policy of ICT in School Education seek to expand internet access and state-of-the-art tools to students and teachers, India falls behind the global standard for providing internet and ICT tools in schools.

Investments in ICT infrastructure should be made according to a set of guiding principles that support affordability and longevity of computing hardware. At the same time, priority must be given to ICT hardware that can be affordably upgraded after 3-5 years, with Zero Point of Failures, as this will reduce support and maintenance costs. Wherever possible, decision-makers must promote green computing by investing in computing hardware that consumes minimal power or runs on renewable power sources. Ideally, all computer hardware must be user-friendly, connect to WIFI and other utilities through Bluetooth or USB, and should be equipped with anti-virus software.

Preferably, ICT platforms for hosting e-Content should empower teachers, increase teacher-student classroom interaction, allow monitoring & tracking of academic progress, generate appropriate usage reports, permit teachers to add assessment questions and MOOC contents as per the syllabus structure. The software should capture data points to further analyse and improve learning outcomes.

Numerous challenges remain in introducing ICT infrastructure in Indian schools. These include ineffective procurement mechanisms, lack of annual hardware maintenance clauses in ICT education policies, insufficient electricity, and availability of hardware. ICT integration in schools is also hampered by the lack of ICT hardware in Teacher Training Institutes, which can leave teachers unprepared to effectively leverage ICT tools in the classroom. Additionally, the emphasis by State Education Boards on content consumption devices such as tablets and smartphones, rather than on content creation devices, limit opportunities to teach students valuable skills like coding and design architecture for the knowledge economy.

Integrating ICT hardware in schools can provide additional benefits for administrators to monitor education outcomes. In particular, greater use of ICT could improve the accuracy of the District Information System for Education (DISE) data, which is currently compiled manually at the local level, since only 10% of schools have computers and reliable electricity. ICT hardware could help improve administrative decision-making at both the district and state level, by enabling more accurate data collection and analysis.

Recommendations:

1. ICT Infrastructure:

1.1. Conduct a state-level survey to determine budgeted and actual spends on Education and ICT infrastructure. Simultaneously, have an expert group in each district assess the relevance of existing ICT infrastructure. Results

from this survey should direct the procurement policies articulated in the NPE.

1.2. Industry consultations should be conducted prior to budget allocation on ICT infrastructure. Following this, an ICT procurement framework should be developed in collaboration with industry stakeholders, which prioritises affordability, usability, e-Waste recycling and ease of maintenance and feasibility of upgrades to avoid technology obsolescence.

1.3. Procurement contracts need to include annual maintenance by the ICT service providers, at a justified incremental cost.

1.4. The ICT policy has to include regular annual assessments of functionality of ICT labs and ICT-enabled classrooms (existing guidelines under the DISE, call for the establishment of ICT labs, computer room, computer aided library and functional internet connection).

1.5. Schools in remote locations should be supported with alternate power sources, to ensure classrooms have consistent access to technology.

1.6. ICT labs need to be created by schools for administrative purposes, to guarantee transparent and efficient recording of data.

1.7. Teachers and administrators need to encourage both content consumption and content creation devices, with increasing focus on content creation devices such as PCs and laptops in higher grade classes.

1.8. ICT Infrastructure requirements should be articulated at Teacher Training Institutes and successful deployment of classroom ICT hardware should be a metric of ongoing teacher assessments.

1.9. BharatNet network envisages delivery of broadband services in over 2.5 lakh villages with a minimum speed of 100 mbps, benefitting more than 200 million rural Indians. Taking advantage of this, schools should be mandated to use the BharatNet infrastructure to catalyse the delivery of internet to schools.

Case studies:

Dell Solar Powered Learning Labs harness the power of technology and teamwork to educate youth

According to the World Bank, 27.7 % of South Africa's population is unemployed, and nearly 25% live on less than US$ 1.25 per day. Lack of reliable, affordable electricity and limited technology access impede the progress of many towns and schools. Research shows, that classroom technology enables students to efficiently learn more material, and improve the odds of children lifting themselves out of poverty — particularly young girls. Dell, along with its regional partners, conceived the Solar Powered Learning Lab as a part of its giving programme, by leveraging partnerships with non-profits and non-governmental organisations, to make the labs a reality. Since 2013, Dell has installed eighteen Solar Powered Learning Labs across South Africa, Nigeria,Kenya,Morocco, Colombia and Mexico, providing access to technology to over 7500 students and their communities[4].

Amity International School, Saket, goes beyond the curriculum to spark inquisitiveness

At Amity International School, Saket, ICT is used in almost every sphere of day-to-day functioning. Every classroom is equipped with LCD projectors and smart boards, which are used by teachers to conduct their lessons. Junior classes have an inbuilt computer aided learning system and a well-equipped digital lab for enhancing language skills. Atal Tinkering Labs, established in collaboration with NITI Aayog and the Atal Innovation Mission, provides the use of 3D printers, Arduinos sets and robotics kits to children from grades VI-XII, giving them a platform to design, create new things and develop new apps.

Besides the equipment installed, Amity Saket conducts specific teacher trainings to integrate ICT in their teaching process to enhance the impact of a child's classroom experience. 'Project based Learning' is also carried out for classes V to VIII. In addition, the school has gone an extra mile to adopt flipped activities using TED-ED videos, watching & reviewing relevant TED-talks and regular participation in online quizzes conducted by government bodies like PCRA, National Safety Science Campaign and mygov.in. The school also helps students by conducting online aptitude tests and assessments on a regular basis. In order to promote technology integration, an inter-school tech fest based on various tech and ICT skills is organised annually. The school also publishes an e-Magazine and has a tech club imparting training and classes for Artificial Intelligence & Robotics. Amitranet, the school intranet portal is utilised on a regular basis for assignments, worksheets, handouts, notices, circulars etc.

In an attempt to use their ICT infrastructure for the larger community as well, Amity has opened its ICT infrastructure for use by EWS girls from AMITASHA and the students from the neighbouring government school.

[4]https://www.dell.com/learn/us/en/uscorp1/corp-comm/solar-power-youth-learning

EduVision School Maturity Model:

Without the right infrastructure and support in IT, a school will not be able to deliver quality content using ICT tools. Consolidating inputs from various sources (including MHRD Recommendations on ICT in Schools*), EduVision recommends using the attached School Maturity model as a guide to establishing ICT Infrastructure in schools.

Level 1	Level 2	Level 3	Level 4	Level 5
Computer lab[5]	Wireless Microphones for Teachers	Smart Board/ Interactive LED Panels	3D Printers	Augmented Reality Labs[6]
Printer	Education Software	Cloud Based Storage & Communication[7] Systems[3]	Laptops Installed in Classrooms for Each Teacher & Students	Artificial Intelligence Tools[8]
Scanner[9]	Audio Visual Room	Uninterrupted Power Supply	Bio-Metrics	Robotic Kits
Broadband Connection (at least 2MBPS[10])	Broadband Connection (at least 5 MBPS)	Wireless Internet Connection (at least 10 MBPS)	Wireless Internet Connection (at least 24 MBPS)	
Operating Software	Interactive Science Kits	Online Student Response and Feedback	Digital Podium[11]	
Electricity (Alternate energy backup)	Technical Assistant, To Manage The Computer Lab	Network and Data Firewall	e-Readers in Libraries	
Computer Aided Learning		In-School Networking		

The cost to set up a basic ICT lab in a Level 2 K-12 school, that caters to 4 sections of 40 students each comes to approximately INR 10 Lakhs. Assumptions and average costs are outlined in Annexure II.

* Revised guidelines for ICT in Schools

[5]One dedicated Computer Lab for the entire school

[6]Allows students to explore the world without having to hold up a device which could distract them from the experience

[7]Storage of reference articles and e-Books, submission of assignments, access to video recordings and audio notes from lectures

[8]Tools that allows educators to visually see and understand how students think while discussing ideas or coming up with solutions,

[9]For archiving and uploading files

[10]The speed has been recommended by MHRD in the set of ICT guidelines for schools released in 2011

[11]Lecture stand that comes equipped with various media components/devices and allows for lecture recording

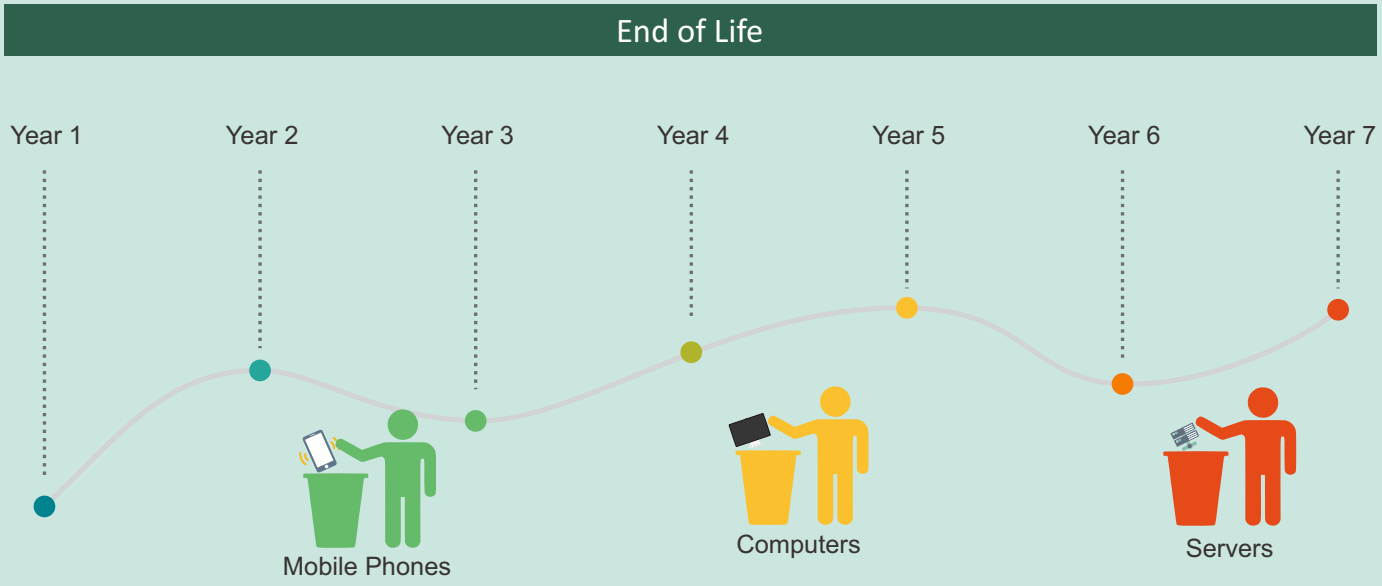
Cognisance of e-Waste should be the first step of setting up ICT Infrastructure:

One of the major challenges India faces, is environment friendly disposal and recycling of electronic waste. The composition of Electrical and Electronic Equipment (EEE) includes many different metals and non-metals, which are difficult to extract. The recycling process is complex but needs to be done from the point of view of resource efficiency and circular economy.

Increased adoption of ICT infrastructure in India would expose students to digital modes of learning, giving them access to quality curriculum. More students using technology means ever-increasing volumes of material, which reach end of life and need to be replaced. Disposal of these items in an environmentally sound manner is a matter of habit, and can be set in place when children are young. It is high time that e-Waste, urban mining, resource efficiency, circular economy and other linked items be introduced to students at the school level.

Over the last 25 years, the country has embarked on a massive consumption spree, which has aided demand and growth. So far, hardware has not been able to cope with the velocity at which software has progressed, leading to redundancy. Waste of these consumables, which otherwise are an environmental challenge, could be used as an opportunity to recycle and pool resources, channelising them into the production process. Not only will this strengthen the processes attracting manufacturing in India, it will also generate livelihood options for its large population base.

Computers reach end of life in about 3-5 years, mobile phones in about 2-3 years and servers in about 5-7 years.



Research and Innovation

Exploring Emerging Technologies

"Previous industrial revolutions liberated humankind from animal power, made mass production possible and brought digital capabilities to billions of people. This Fourth Industrial Revolution is, however, fundamentally different. It is characterised by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human." - World Economic Forum.

For students, this means that the world they inherit will change at a much faster pace than it does today. Unlearning, relearning, critical thinking and emotional intelligence will be the cornerstones that determine their success. In order to triumph in their journey, it is imperative that they keep pace with developments in the space of emerging technologies, equip themselves to ask the right questions and focus on innovation.

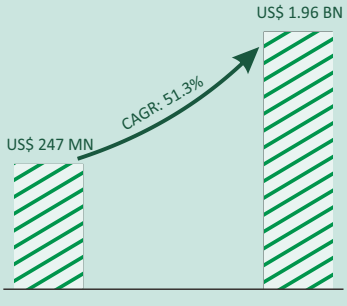
Integrating cutting-edge technologies and research & innovation into the educational process will be essential as India attempts to keep pace with dramatic changes in the global technology landscape. Increasingly, education has become a critical testing ground for ICT interventions, including cloud computing, open learning, mobile learning, classroom gamification, augmented reality, 3D printing, robotics and learning analytics.

ICT interventions:

Cloud Computing: Cloud computing opens a universe of new opportunities for students, particularly for those who are not served well by customary training frameworks. It allows educators to provide quality training to a greater number of students and enables more sophisticated monitoring and evaluation.

MOOCs: Open learning in the form of MOOCs broadens access to training that is traditionally offered through formal education systems, and has been adopted by non-certificate-granting programs including edX, Coursera and Udacity.

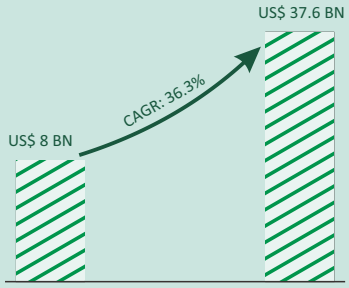
Nevertheless, challenges remain within the MOOC framework, such as potential lack of administrative oversight or quality assurance systems, infrastructure limitations in developing countries, unequal access to technologies required for participation and uncertainty regarding the use of copyrighted materials.



INDIA'S OPEN LEARNING MARKET
SOURCE - KPMG

Mobile Learning: Mobile learning using personal electronic devices such as handheld computers, MP3 players, notebooks, mobile phones and tablets can be used to enhance student-centred learning and group collaboration among students through communication applications, interactive displays and video features.

In India, where the Telecom Regulatory Authority of India (TRAI) estimates that more than 70% of the population is connected with personal devices – mobile learning has the potential to transform the education sector. However, content, social and behavioural challenges should be studied further, in order to effectively deploy mobile technologies in education.

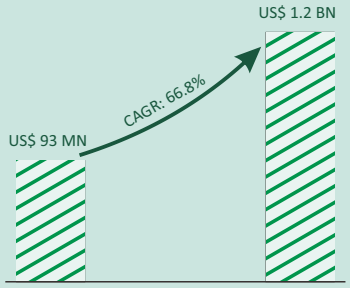


GLOBAL MOBILE LEARNING MARKET
SOURCE - MARKETS & MARKETS REPORT

Classroom Gamification: Classroom gamification, which uses video game design and game elements in classrooms, can promote increased engagement in learning.

As countries explore the use of classroom gamification techniques, its effectiveness and relevance remains a subject of debate among education stakeholders in India.

Robotics: Educational robotics that facilitate students' knowledge on how to design, analyse and operate robots, can be utilised across the entire educational spectrum—from elementary school to graduate programmes. The educational robotics market has huge potential in India and is growing at nearly 21% a year. Education experts are evaluating ways in which robotics can be integrated in education at different levels and its impact on learning.

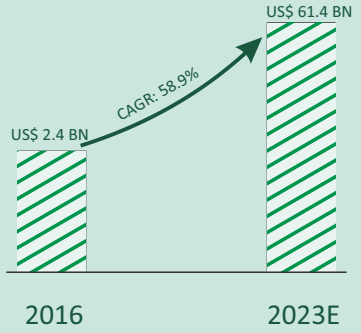


GLOBAL EDUCATION GAM'N MKT.
SOURCE - RESEARCH & MARKETS REPORT

3D Printing: 3D printing positions students as creators and allows them to gain hands-on experience with innovation and entrepreneurship. India's 3D printer market is estimated to reach USD 79 million by 2021 with the majority of demand emerging from Tier-I cities. The Indian market could accelerate growth for domestic manufacturers, assemblers and distributors due to the increasing use of rapid prototyping and 3D modelling across multiple industries.

Augmented Reality: Augmented reality tools have the potential to transform the learning environment in Indian schools by allowing students to study and interact with course materials from any device at any time, minimising the need for financial investment in supplementary learning materials, which can become quickly worn and outdated.

Learning Analytics: Amid growing focus on measuring educational outcomes through quantitative metrics, learning analytics offer schools a means of conducting real-time student learning assessments. Administrators can record feedback & evaluations in databases and provide ongoing monitoring & assessment to promote continual improvement in pedagogy and student learning outcomes. While learning analytics are becoming increasingly popular in private schools, where they are used to track student progress over a set period, deploying them in public schools will provide teachers and government officials with nuanced analysis on student learning.



GLOBAL AR MARKET
SOURCE - MARKETS & MARKETS REPORT

Recommendations:

1. ICT Interventions:

1.1 Schools should leverage cloud computing in order to effectively track student progress and ensure that all students receive quality training.

1.2 Administrators need to explore opportunities to integrate open learning into school curricula.

1.3 Mobile learning technologies, including handheld computers, MP3 players, notebooks, mobile phones and tablets should be adopted for use in classrooms.

1.4 Policymakers and educators must further explore how gamification of learning can be leveraged to motivate and engage students.

1.5 Augmented reality tools need to be adopted in order to improve learning tools accessibility and save costs on prototypes, physical models, detailed illustrations and posters.

1.6 Investments should be made in 3D printing in order to equip students with new skills and technologies, which they can use to tackle real-world challenges facing their communities.

1.7 Educational robotics should be integrated into school curriculum in order to teach students how to design, analyse, apply and operate robots.

1.8 Learning analytics need to be deployed to measure, collect, analyse and report data about learners and their contexts, in order to optimise learning environments.

1.9 Artificial Intelligence can be used to translate content in vernacular languages. Entrepreneurs should be encouraged to develop solutions that translate existing English content into regional languages. This will ensure that the deployment of ICT tools is not restricted on account of language.

1.10 In order to enhance the outreach of Atal Tinkering Laboratories (ATLs) in schools across India, Atal Innovation Mission's vision should be linked to support each Block Resource Centre (BRC). This will foster a design mindset and encourage computational thinking, adaptive learning and physical computing. BRC and Cluster Resource Coordinators (CRC) are currently assigned with the task of monitoring, providing education and other support to teachers, while also mobilising the local community to participate in school management and extend support to the school system. Merging these two successful initiatives could vastly expand the reach and positively impact the quality of education at K-12 level.

Case Studies:

Atal Tinkering Labs

The lack of innovation in teaching STEM subjects' limits students from taking full advantage of their potential. The theories, principles, properties, theorems and various tenets covered under STEM, become convoluted for many students and this eventually leads to adoption of memory-based learning methods. As a result, many of the higher-grade students are unable to remember even the basic STEM texts and references that they read in lower grades. In order to engage the multiple senses of students and provide them with practical experience of the concepts of STEM subjects, the Atal Innovation Mission established Atal Tinkering Laboratories (ATLs) in schools across India. ATL's provide a space for young minds to work with tools and equipment to understand the concepts of STEM. It provides students with educational 'do-it-yourself' kits and equipment on – science, electronics, robotics, open source microcontroller boards, sensors, 3D printers and computers. The labs are also equipped with meeting rooms and video conferencing facilities. ATL's have created a significant impact in fostering curiosity, creativity and imagination in young minds; while inculcating skills such as design mindset, computational thinking, adaptive learning and physical computing. As per Government numbers, ATLs have been established in 5,441 schools across India, bringing hands on learning experiences to more than 60,46,146 students.

Under the umbrella of the Atal Innovation Mission, numerous programmes such as the Atal Tinkering Marathon, orientation programmes for teachers, etc., have been operationalised. The Atal Tinkering Marathon saw the participation of over 35000 students, wherein 650 of the best innovation entries were submitted for evaluation. Of these, the top 30 innovations (across six different focus areas aligned with National programmes from 17 states and 3 Union Territories) were identified for recognition. These innovations will now be further handheld to see if they can be scaled up and developed into commercial products.

In order to sustain and further enhance the outreach of ATL , the Atal Innovation Mission is looking at providing grant-in-aid to Block Resource Centres so that ATLs can be established in every Cluster Resource Centre. Bringing ATL to each Block Resource Centre would provide a huge boost to the Government's endeavours in bringing quality education to the last mile and would also help in providing access to tailored education for children with special needs. The Atal Innovation Mission, could also on a pilot basis, allow private enterprises to adopt Block Resource Centre and delegate the responsibility of operationalising ATLs to them, after setting up infrastructure and capital.

AIM will provide each school a grant-in-aid of Rs. 20 Lakh, that includes a one-time establishment cost of Rs. 10 lakh and operational expenses of Rs. 10 lakh for a maximum period of 5 years, to setup ATLs within their premises. AIM has selected 5441 schools for setting up of ATLs in their institution. Out of these, 1877 schools have already been given grant-in-aid to setup ATL; 3000 schools selected in June 2018 are yet to complete their compliance stage for getting the funds and the rest are in the process of documentary compliance and verification.

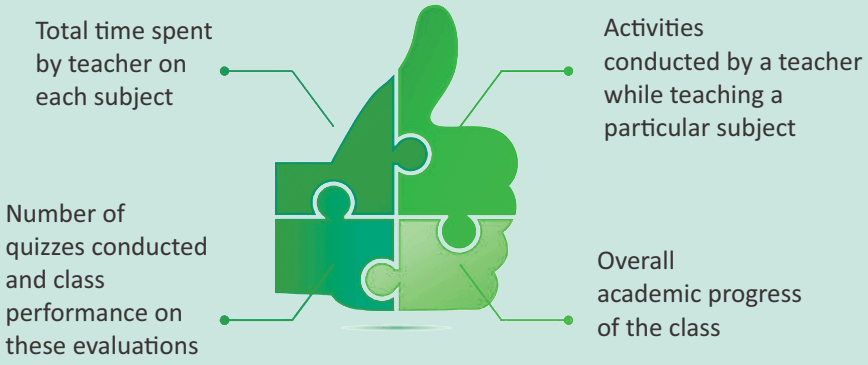
Monitoring, Evaluation, & Assessment

Gauging teaching impact and linking past, present and future action

Effective monitoring mechanisms are vital tools for ascertaining the progress of an academic plan and evaluating whether the curriculum followed is resulting in better learning outcomes. Indian schools lack sufficient data on the academic progress of its educators - leaving administrators with limited visibility on how to improve classroom interactions. This limitation is particularly pernicious, as ineffective monitoring of student engagement with their course material, has led to high dropout rates among India's secondary school students. Indeed, 16% of boys and 17 % of girls who left school articulated that they dropped out after failing in school.

It is therefore important that teachers are equipped with tools to monitor student progress and intervene when students are unable to cope. This can be achieved by developing and deploying an offline technology platform that captures daily, real-time data in digital classrooms.

Offline Technology Information Deployment for Administrators



To make sure technology-enabled classrooms deliver high-quality e-Content, officials and administrators should develop a set of guiding principles for choosing and evaluating e-Content tools used in ICT and Digital Classroom projects. These guidelines should evaluate e-Content platforms according to specific metrics, such as their capacity to track a programme's usage among teachers, between grades and across varied subjects.

Platforms should also enable administrators to assess the ICT skills of students at specific points in the education system and explore the extent to which ICT can be used to support students with special educational needs. To assess the impact of ICT deployed in classrooms, e-Content platforms should also be enabled to capture observations of teaching as well as learning.

Regular assessments can effectively track classroom progress, following the completion of a baseline exam. The results of these assessments will enable teachers to bifurcate their classrooms into groups according to the students' capability and tailor the curriculum as well as interventions accordingly. e-Content platforms have the ability to facilitate these online and multiple choice (MCQ)-type assessments, to quantify and generate reports on student understanding in classrooms using CAL. These assessments will also serve as investigative tools that could provide a basis for monitoring India's progress on the Sustainable Development Goals, which have been a driving force behind India's advancements in public education.

Similarly, the adoption of Continuous and Comprehensive Evaluation (CCE) programmes allow teachers to periodically evaluate students and track their progress. These programmes also help reduce student workload by giving them the opportunity to take multiple, smaller tests throughout the year instead of one or two tests covering a more significant percentage of the syllabus. Besides academics, teachers need to measure student progress on skills and abilities such as public speaking abilities, teamwork and overall social behaviour. Well-trained teachers can drive micro innovations at school level that could be leveraged by other teachers across the nation. However, the lack of adequate teacher training has rendered CCE an arduous, task-oriented process. Going forward, educators and policymakers should develop a holistic training programme for teachers, for effective implementation of CCE.

Recommendations:

1. Identify Gaps Between Policy and Implementation

1.1 In order to have a consolidated visual display of information for monitoring, a digital dashboard should be created to track the performance of teachers and schools with regard to the usage of ICT tools in imparting education.

1.2 A committee consisting of educators, administrators and researchers, should be formed under the aegis of the Government, to track the annual performance of a school, its teachers, and students.

1.3 Parameters such as infrastructure, content creation, impact on learners, teacher training and use of emerging technology should also be included.

1.4 Selected e-Content should be platform-based and enabled to track the usage of e-Content among teachers, grades, and subjects.

2. Conduct Training Programmes to Address Gap Areas

2.1 Focussed teacher trainings on topics of Design Thinking and STEM Education must be developed in order to encourage educators to generate their own content on these topics.

3. Assessment of Effectiveness of training Programmes

3.1 e-Content platforms should be enabled to capture observations of teaching and learning in activities in order to assess the impact of ICT deployed in classrooms.

3.2 Selected e-Content platforms should be able to generate reports on teaching time and provide a classroom performance analysis on assessments for a chapter, topic or subject.

3.3 Yearly assessments should play a direct role in ranking school progress and defining outcomes for the subsequent periods.

3.4 Technology usage in the pedagogical discourse of schools should be inculcated as a parameter, where the teachers are assessed and evaluated basis the frequency of usage and effectiveness of such tools. This will help identify areas of strength and those aspects of teaching which need to be further developed.

3.5 Reports should be generated to capture the quantity of new content and new assessment questions added by a teacher, as well as the general extent of lesson planning performed by the teacher.

3.6 Under the National Mission in Education through ICT (NMEICT), applications for various awards conferred by the MHRD should be invited from schools/ teachers, projecting their usage of ICT in teaching - showcasing improvements in learning outcomes of students and design of innovative pedagogical tools. This will provide further motivation to teachers and administrators alike.

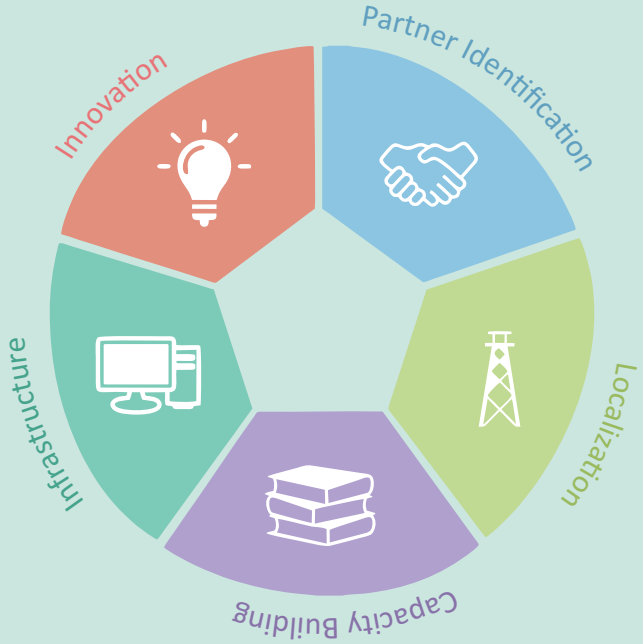
Industry Framework for Contribution

Guidelines for Corporate Social Responsibility Investments in Education

Education accounts to a whopping 70 % of all Corporate Social Responsibility (CSR) spending in India and was pegged at Rs. 15484 crores between 2014 and 2018 Despite this significant private sector investment, student learning outcomes have remained stagnant due to low retention rates and lack of effective engagement in school curricula – particularly in secondary school classrooms. Notably, dropout rates rise sharply between primary school – where 95.64 % of boys and 96.12% of girls are enroled – and secondary school, where the dropout rate is 17.21% among boys and 16.88% among girls. Although financial reasons and family constraints play a large role in disrupting student education, poor teaching and ineffective student progress monitoring have also emerged as significant factors fuelling India's dropout rates. For example, 34% of boys and 19% of girls who left school, cited lack of interest as a driving impetus – suggesting that efforts should be made to develop more engaging lesson plans.

To date, most corporate investments in India's education sector have focused only on providing physical infrastructure and tuition support, rather than improving learning targets by enhancing curriculum delivery or access to cutting-edge learning tools. As companies calibrate their CSR strategies in the field of education, more targeted and informed efforts to leverage ICT can help improve access and enhance the quality of learning outcomes.

Parameters for Companies to Forge Project Partnerships



By deploying affordable, replicable, and scalable ICT interventions, companies can build capacity, improve infrastructure, and foster innovation among Indian students, teachers, and administrators. To this end, the following questions can serve as a guide to help companies develop more meaningful and impactful projects.

1. Identifying a partner:

1.1. Depending on the level of engagement in terms of project management responsibilities, what partnership model should the company choose?
1.2. What is the potential partner's geographical reach, access to resources and track record of improving student learning outcomes?
1.3. What resources would be required from company and the potential partner to achieve long-term goals?
1.4. Does the potential partner have strong connections to the community and the ability to garner robust stakeholder buy-in in the target location?
1.5. Do the potential partner's values and objectives align with those of the company – is sustainability of the project a long-term vision?
1.6. Who will be responsible for regular monitoring and evaluation of the project?

2. Localisation:

2.1. What is the physical infrastructure support (power lines, electricity, internet access etc.,) available at the project location ?
2.2. Will the project garner sufficient stakeholder buy-in from teachers, administrators, parents and students to achieve its objectives?
2.3. Does the project align with government priorities, or does it fill unaddressed gaps that would be welcomed by the state or local government?
2.4. What are the other CSR activities taking place in the region? Does the project offer any new or complementary services to address unmet needs?
2.5. How will the project be adapted to accommodate local language requirements as well as cultural and/or religious norms?

3. Capacity-Building:

3.1. How does the project incorporate ongoing teacher training to ensure that educators attain digital literacy and continued skills development?
3.2. Will the project teach administrators to deploy and utilise ICT tools to improve productivity and evaluations in schools?
3.3. Does the project facilitate peer-learning opportunities for teachers and administrators within and across institutions, by creating channels of communication to share content, experiences and best practices?
3.4. How will the project increase technology literacy among students and offer enough exposure to apply their newly acquired skills?
3.5. How will the project engage parents to create awareness about the necessities and benefits of technology exposure and foster a supportive environment for students?
3.6. Does the program ensure equal access to resources for under-served students (special needs, low-income and female students)?

4. Infrastructure:

4.1. Has the project considered investments in hardware and software that will have the most transformative effect on education outcomes, given local needs?
4.2. Does the project use flexible and user-friendly e-Content platforms to empower teachers to create and share original e-Content, track academic progress and utilise a variety of tools?
4.3. Does the project have a long-term maintenance plan for hardware deployed in educational institutions to ensure longevity of the devices?
4.4. Will the company provide updates to software infrastructure to ensure that teachers can continue to create fresh and innovative content?

5. Innovation:

5.1. How will the project use innovative, creative and engaging content platforms to enhance curriculum delivery and student learning outcomes?
5.2. Does the project introduce cutting-edge technologies such as augmented reality and classroom gamification, to

offer new ways for students to interact with course material, thereby imparting new analytical skills?

5.3. To what extent does the project empower students as creators by giving them hands-on experience with 3D printers and robotics?

5.4. Does the project support continuous learning outside of the classroom through open learning capabilities or mobile compatibility?

5.5. How does the project help teachers track real-time student performance and effectiveness of their lesson plans through learning analytics? Does the programme enable teachers to tailor their curriculum based on feedback and results?

ANNEXURE I

Expert Group		
P. Krishnakumar	VP, MAIT	Dell
Anwar Shirpurwala	CEO	MAIT
Anjalee Prakash	Chairperson	Learning Links Foundation
Archana Singh	Academic Coordination	Amity International School, Saket
Archana Sahay	Giving Manager	Dell
B.Shadrach	Asia Coordinator	World Wide Web Foundation
Charru Malhotra	Associate Professor-eGov-ICT	IIPA
Dipakshi Mehandru	Sr. Advisor-Policy & Govt. Affairs	Dell
Divya Bhatia	Principal	Amity International School, Saket
Girish Prabhu	Founder & CEO	GurujiWorld Technologies
Lokesh Mehra	Director	Millionlights
Dr. Piyush Gupta	e-Gov. Advisory Consultant	Independent
V.K. Nangia	Professor-Emeritus	IIT Roorkee
Vashima Shubha	Associate Director	PWC
Vigneswara P.	Associate Professor	IIT Delhi
Dr. Vinnie Jauhari	Director- Education Advocacy	Microsoft Corporation

ANNEXURE II

The cost of setting up a functional computer lab*	Unitary Cost (INR)	Qty.	Total (INR)
Cost of PC (21)	36,000	21	756,000
Broadband Internet (5 MBPS)	30,000	1	30,000
Operating Software (with updates)	7,000	1	7,000
Computer Aided Learning Software	As per the requirement		150,000 (approx)
Education Specific Software			
Interactive Science Kits	Provided by ATL		
Salary of a Technical Assistant	25,000	1	25,000
Projector + Screen	30,000+15,000	1	45,000
Printer- Scanner	12,000+5,000	1	17,000
Wireless Microphone for Teachers	8,000	1	8,000
TOTAL			**10,38,000**

*** Indicative cost**

About MAIT

Set up in 1982, MAIT is the apex body representing India's ICT sector. MAIT is recognised by both the Government, as well as the industry, for its role in the growth and development of the IT Hardware Industry. MAIT believes that technology is the primary contributor of economic growth and with its consistent policy advocacy efforts, MAIT has emerged as a strong and effective industry mouthpiece, within government corridors.

Headquartered in New Delhi, and with key affiliates across the globe, MAIT offers a wide range of programmes and services to its members, as well as the entire ICT industry across the country. These initiatives include organising conferences, seminars, training sessions, events & workshops; policy representation; domestic & international marketing support; technology initiatives; publishing industry related information; networking opportunities and many other industry-directed services. MAIT works in multiple areas for public advocacy: Cloud & Analytics, IPR, Skill Development, Component Trading Hub, State IT/ ESDM Policies, Import/ Export Policy, GST, Procurement Reforms, e-Governance, SMEs, e-Waste, Innovation & Start-up, Industry 4.0, IoT Devices, Smart Cities Solution & Standards, amongst others.

MAIT's member profile spans all areas within the industry, including manufacturers, system integrators, solution & service providers, e-Waste recyclers, testing labs, software developers, IT park developers, consulting organisations, companies in the areas of cloud & IoT, etc. With the constant support of its members, MAIT is today, an influential and dynamic body that is committed to collect, process and disseminate information & knowledge pertaining to the development of the information industry, with government agencies and professional bodies. MAIT works to ensure transparent governance leading to a responsive Government.

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