

## e-Discussion on UN Solution Exchange ICT for Development and Education Communities

### Consolidated Reply of the 1<sup>st</sup> Query:

#### Query: *Framework for ICTs in School Education: Investment Issues - Infrastructure*

**Moderator's note:** We are happy to host an e-discussion on a framework for the use of ICTs in School Education, which could feed into the policy formulation process of the Government of India. This is the first query in a series of three queries forming part of the e-discussion. We request you to contribute your suggestions and insights, as well as the insights and suggestions of your colleagues and associates. We encourage you to broaden the discussion to your contacts in NGOs, schools, government, local authorities, private sector, and other non-members who you feel would have something to contribute.

The Ministry of Human Resource Development (MHRD), Government of India, has initiated the process to formulate the 'National Policy on ICT in School Education' with a focus on addressing the needs and challenges of teaching and learning in schools using information and communication technology tools.

The Global e-Schools and Communities Initiative (GeSCI), a UN ICT Task Force founded organisation, will provide strategic assistance to MHRD in the preparation of this policy. GeSCI has partnered with the Centre for Science, Development, and Media Studies (CSDMS) to coordinate and facilitate the process of policy formulation. I am working as the lead facilitator of the Action Group to engage online communities to solicit expertise from members, and thus contribute to the consultation process.

There is yet no draft policy document that can be shared for consultations and comments. We have instead developed a consultation process document (available at: <http://www.solutionexchange-un.net/in/ictd/cr/res28030801.doc>) to help us gather inputs for feeding into the policy formulation process. This process document outlines seven thematic areas along which we are seeking suggestions.

As an input into this consultation, we propose to run an **e-discussion series** on Solution Exchange, to solicit suggestions and insights from the ICTD and Education Communities. For this purpose we have grouped these seven topics into three broad areas: The first discussion will cover investment issues, and address the topics of **Infrastructure** and **Capacity Building**. The second discussion will cover content and quality issues, and address the topics of **e-Content**, **Quality in School Education**, and **Innovation and Research**. The third discussion will cover programme delivery issues, and address the topics of **Public-Private Partnerships**, and **Monitoring and Evaluation**.

Each of these discussions will be open for **two weeks**, beginning with the investment e-discussion.

Issue	Question 1	Question 2	Question 3	Question 4
Infrastructure	What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure? Are there any good examples where these challenges were overcome?	Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?	Do you have any insights about the process of setting up ICT infrastructure in schools?	Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?

#### Response List: 19 responses

1. Vineeta Dixit, National Institute for Smart Government, New Delhi
2. Rajen Varada, Technology for the People, Bangalore
3. Sunill Nigandhi, M/s. Gurukul Online Learning Solutions, Mumbai
4. Kannan Srinivasan, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum
5. Jitendra Shah, Indictans, Mumbai
6. Anindya Kumar Banerjee, Panchayats and RD Dept., Government of West Bengal, Kolkata
7. John Mathew, Business Consultant, Kochi

8. Anindya Kumar Banerjee, Panchayats and RD Dept., Govt. of West Bengal, Kolkata
9. Frederick Noronha, Bytes for All, Goa
10. Venu Arora, Ideosync Media Combine, Faridabad
11. Jitendra Shah, Indicttrans, Mumbai
12. Michel Bauwens, P2P Foundation, Bangkok
13. Anindya Kumar Banerjee, Panchayats and RD Dept., Govt. of West Bengal, Kolkata
14. M V Ananthkrishnan, Developmental Infomatics Lab, KReSIT, IIT Bombay, Mumbai
15. Srinivasan Ramani, International Institute for Information technology, Bangalore
16. Anjela Taneja, ActionAid, Bhopal
17. Anindya Kumar Banerjee, Panchayats and RD Dept., Govt. of West Bengal, Kolkata
18. Binay Pattanayak, National Technical Support Group (SSA), New Delhi
19. Anil Prasad, Finance Department, Government Secretariat, Kerala, Thiruvananthapuram

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### Response 1

Vineeta Dixit, National Institute for Smart Government, New Delhi

From the several questions that you have raised related to infrastructure, I would like to share some experiences from an International as well as India perspective:

**1) What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure? Are there any good examples where these challenges were overcome?**

Whenever such a query is raised some of the oft given answers relate to ubiquitous access per child - the latest trend being the advocacy for one laptop per child. However, the reality is that in most countries (including the 'developed' ones) such a scenario does not exist. There are several examples from UK, US and now in Africa where even with limited access in school, the 'real access' is being granted over web. So what we need to do perhaps is to re-phrase the question and may be ask - what minimum infrastructure is needed at school to -

- 1) support and improve delivery of educational content;
- 2) support and improve school administration; and
- 3) support and improve the school outreach programme

May be then we can get a fix on what we ought to be looking at in terms of minimum requirement and build from there.

**2) Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?**

**3) Do you have any insights about the process of setting up ICT infrastructure in schools?**

The answer to these two questions perhaps lies in the Public Private Partnership (PPP) approach. Although this is a topic that is scheduled for discussion later, I would just like to share some experiences based on our experience in Africa. We provide end-to-end solutions to educational institutions across African continent and currently serve over 1 million students. The key to service provision is zero-cost vendor financing model which is so popular in e-governance now. Basically the user pays a nominal amount to access the system. The user charge pays for the upkeep and upgrades and the user in return gains reliable access and latest technology.

Depending upon the requirement of the school/college, we provide different infrastructure - sometimes it is one server supporting a multitude of thin clients and other times it a network of PCs. However, since most schools are not independent in decision making, even when they do not have to invest a penny, a lot of time is wasted in getting an agreement for the infrastructure. A possible solution to the problem may be that a price band be defined by the government which could be proportional to the infrastructure-student ratio and the schools may decide who would do it for them. It would not only de-centralise decision making but also give schools a sense of control of the service providers who otherwise may consider themselves accountable only to the education department.

**4. Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

This is a tricky question often leading to debates about redundancy and cost sharing. Just to elaborate, some may ask why not use the infrastructure being created under common services centre scheme? The only reason why I brought this up was to say that it may be better not have a pre-defined policy regarding such a matter because it will depend upon several factors such as

- who 'owns' the infrastructure
- what is the business model
- for what purpose is it being used
- who benefits (especially financially) from such access and
- who will pay for the access etc.

What may be more effective is to let the group of schools e.g. municipal schools in a city may decide what is the best way to use the infrastructure e.g. they may wish to use it as a cyber cafe and not just community learning centre, to generate some funds.

The second issue at hand here is that many schools today operate in two 'shifts' especially in cities and a trend that is increasingly catching up in small towns as well. So will it leave sufficient time for 'other' activities?

There are of course many such questions and experiences that support or contradict what I have enumerated and hopefully my initial thoughts will help us crystallize them.

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## **Response 2**

**Rajen Varada, Technology for the People, Bangalore**

**What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure?**

**Are there any good examples where these challenges were overcome?**

The key challenge for infrastructure - if referring to computers in schools are:

1. Power
2. Maintenance
3. Operating System software

1) Power: Even today, the power situation in rural areas even in so called developed states continues to affect the functioning of any ICT initiative. Power cuts with different power cut schedules each week play havoc with the timetables. Power outages and fluctuations add to the high maintenance costs of computer hardware.

2) Maintenance: maintenance has three very critical components. 1. Preventive maintenance. 2. Troubleshooting and 3. Repair. Computer malfunction (either system software or hardware are common and without preventive maintenance resulting in costlier breakdown, regular preventive maintenance can address most problems and pre-empt hardware crashes. Troubleshooting problems and identifying whether it is hardware or software at the site helps in identifying problems and reducing cost of maintenance engineers visits. Repair facilities within a reasonable distance are required to reduce the downtime of the equipment.

Without local support computer breakdowns have a long turnaround time for repair. It is essential that government put into place the maintenance backbone required to keep the hardware functioning. Computer maintenance requires not only hardware but knowledge of operating system software trouble.

3) System software is expensive and prone to upgrades and requires resources put aside for new version upgrades- such as from XP to Vista. OS itself adds to the cost burden of the hardware. There is a need to address this issue as it has long terms affect on not only the cost component but what future generations see a "standards" in OS.

**Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?**

UNICEF in Andhra Pradesh, tried this with the Sisu Samrakshak project in 2003 in 7 school locations of Mysore district. Issues of responsibility on who would pay for repairs was one of the key bottle necks, the schools felt they would not pay for breakdowns, if the community used the computers after school hours. Community members felt that since it was owned by the school they were not responsible. Another drawback in many rural locations is the distance from the villages to most schools which makes it difficult to include "piggy back" initiatives.

**Do you have any insights about the process of setting up ICT infrastructure in schools?**

Government is very good at setting up infrastructure as it is done by selected vendors - It is for the upkeep and ongoing support that the systems are not in place. This is the area that will be a key challenge to address.

**Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

Seeing the hesitation in most schools to share their infrastructure with the community there is a need to evolve a School Social Responsibility policy! (SSR) where-in a school commits to a set of hours in a month for the community. I leave this thought with forum members for more lucid answers.

In India there are various technology tools already in place such as satellite connectivity, cable etc, which can have dual use. The innovative use of existing technology needs to be explored.

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## **Response 3**

**Sunill Nigandhi, M/s. Gurukul Online Learning Solutions, Mumbai**

Just for our awareness, we have roughly 6.5 million Internet users in a country of 100 billion plus, the most important deterrents to capacity building for most of the Educational Institutes can be identified as under (this is as per our experience over the past six years, since our company M/s. Gurukul Online Learning Solutions has been in the field of e-learning & have developed major competencies on ICT platform):

1. **Initial cost** associated with putting up the infrastructure, which is a major deterrent for any educational institute including some of the most reputed universities. Public Private Partnership is the best alternate as per our understanding
2. **Lack of trained faculty & lethargy on part of Management & Faculty** to upgrade themselves here we felt that they need no added incentive in monetary form but more training programmes, which are not routine but offer them a chance to view the benefits of ICT based training are required.
3. **Initial resistance to change**, since teachers believe they shall be redundant once technology comes in, they need to be convinced that technology is no substitute its only a platform of knowledge transfer in an effective manner.
4. **Lack of band with & other technical support functions** across states including some of the so called advance states to have embraced technology.
5. **Lack of awareness** with regards to utility of ICT for education, some places basic computer lab is enough to show that we have embraced technology.

We have undertaken major programmes with various state governments & private universities infusing technology for providing better solutions, we are the technology providers for various universities across India for offering their solutions & courses on e-learning platform, for e.g. for Amity university URL link for reference [www.amityelearning.com](http://www.amityelearning.com) or Bio Informatics Institute URL link [www.biionline.org](http://www.biionline.org) wherein we provide the entire content in web learning mode

1. With 2D & 3D effects so as to offer students a feature rich experience of learning subjects.
2. Uniform level of training programme across, since best of faculty can be online & conduct virtual classrooms across India & abroad.
3. All assessment & assignments are offered on an online platform with tutor interface given to Institutes to monitor minute by minute progress of an individual student.
4. More interactivity is built in & module wise assessments are assigned to monitor progress of the students.
5. Reduces the cost of operation over a period of time, saves lot of energy & traveling time of students since learning can be self paced.
6. The entire learning process is customised as per requirement & rigour is built in to students learning.
7. The whole process of providing information, admission, generation of Id & learning is based on ICT platform, even the assessment's are conducted online & results are immediately forwarded to the institute so as to reduce the entire cycle & give better delivery to students.

We would like to introduce the same process across in schools, in their admission process including initial information, submission & distribution of admission forms (less hassles for parents), submission of class assignments (helps by having their entire work sheets to be stored on an server a minimum price for them not having to carry heavy bags from home to school & back), assessments etc plus creating & delivery of feature rich content so as to provide them with over all better learning platform. ICT shall help reduce time, money & optimise resources to the fullest.

With regards to Infrastructure we can help in form of PPP by partnering various bodies to provide them the entire infrastructure including hosting of servers & providing last mile connectivity to the institutes.

I guess the Government with all its resources can definitely help the cause most & it has already initiated the first step by asking our suggestions through CSDMS. I hope things shall improve on all fronts given all our joint efforts & we are able to provide a healthy learning culture for our students in future.

Since you have initiated a good debate, I hope that we shall have many more use full suggestions from our esteemed colleagues from various agencies.

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#### Response 4

**Kannan Srinivasan, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum**

**Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?**

ICTs have a lot of scope for delivering innovative contents to School Education. I recall my experience on teaching Environmental Education to Government schools in Chennai in late 90s where I was constrained by limited education technology tools for such education.

For an example, when I tried to explain the Green House Effect I had tools using glasses and other boards to show the green house. When I explained the global warming and CFC and so on it was very difficult. But it helped to me understand the concept better. But in today's development, it is very easy to use the tools by creating flash animated tools for such things.

Another experience of mine on using Teleconferencing in Teachers training programmes. When various methods were used, one popular medium was video programmes compiled on a subject. For an example a video cassette on Elementary Mathematics, where there are songs, puzzles, games, demos, dance and so on to explain the operations, numbers, and other mathematical forms.

I feel strongly ICT may contribute in these areas. I suggest,

- 1) Use the ICT for teaching mathematics by introducing some entertaining way of methods such as games, songs, puzzles, exercises, dances, and so on. One may visit the <http://www.bbc.co.uk/> site for such games online for the smaller children.
- 2) We must use ICT for the environmental sciences subjects to explain the concepts on Green House effect, global warming, molecular reactions, bonding, micro organisms, and so on.
- 3) The other area it has an impact is on the Social Studies. Which medium other than Video or TV is as effective as this for imparting the social science contents. This has a power to show stories of the movements, practices and so on. Some initiatives are there in the Doordarshan. DECU (Development and Educational Communication Unit) of the SAC (Space Application Centre [http://www.isro.org/centers/cen\\_sac.htm](http://www.isro.org/centers/cen_sac.htm) ) is trying to use this technology for such purposes for their programmes on Nano technology and other science promotion programmes in Doordarshan.

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## Response 5

**Jitendra Shah, Indictans, Mumbai**

**1) What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure? Are there any good examples where these challenges were overcome?**

What minimum infrastructure is needed at school to?

- support and improve delivery of educational content;
- support and improve school administration; and
- support and improve the school outreach programme

Answer:

Learning environments vs Delivery: We should envisage abundance of information, using satellites and cheap broadband with even cheaper devices for access. I advise against the OLPC (One Laptop per Child) model but would advise for shared lightweight laptops, without hard disks, even WI-FI mobiles, connected on a village server, mobile servers like a bus visiting for a few hours etc., we could begin with citywide WI-FI. I recommend the use TV medium too.

I wish we can make the assumption of abundance of 'content' and even interaction in a horizon of a few years, given the pace of dropping prices of electronics and rising cost of quality human resource. The objective should not be to replace the teacher but to support her/him by introducing learning materials and methods so she can mentor better.

Data Centres: This will entail requirements of repositories of material: make Free and open source 'contents' (static materials as well as programs) available on data centres (say one in each state), one could use State data Centres if available. Perhaps a Public Private Partnership model may give better facility.

**2) Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?**

Though this is not a very creative idea of mine, the idea of Public Private Partnerships (PPP) appears workable. However efforts have to be made to make internet facility safe, guaranteed prevention of pornography can make many parents feel safe about the medium. Economics of commercial Internet Service Providers (ISPs) may not allow them to offer such, hence, ISPs for education may have to be registered. It costs nothing much these days to get ISP license.

The key to the success of ICT initiatives and their upkeep is the trained teacher who sees ICT as a feather in her/his cap, as against an additional burden as it is often, today.

**3) Do you have any insights about the process of setting up ICT infrastructure in schools?**

I recommend the use of a server with a standby and thin clients system. Less energy, better manageability.

**4) Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

- \* who 'owns' the infrastructure
- \* what is the business model
- \* for what purpose is it being used
- \* who benefits (especially financially) from such access and
- \* who will pay for the access etc.

PPP model as in case of Common Service Centres ([National Council of Education Research and Training](#) (NCERT) is also thinking on these lines). I would suggest making them urban or rural Common Service Centres.

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**Response 6**

**Anindya Kumar Banerjee, Panchayats and RD Dept., Government of West Bengal, Kolkata**

**1. What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure?**

The key challenges faced using ICT in school education with regard to ICT infrastructure:

1. The main weapon/tool to defeat the illiteracy level for IT/ICT is a PC which is not standardised.
2. There are no standards set for the ICT in school as the PCs get older every 6 months to upgrade.
3. There is no pan India policy guiding the school education department on choosing the right courseware (it is practically dependent on one person who is again dependent on one technology be it Proprietary or Open Source [here as it should be Open Standards]).
4. No options have been thought of for using alternate source of power in schools where no grid power is available [fact being there are schemes for Akshay Urja Shops 100% subsidized project for such locations].
5. There are no set rules on re training the faculty members of such institutions as they are actually outsourced to Private partners who are more interested to earn their money back [BOOT Model].
6. Last but not the least the students who are the main stakeholder/beneficiary innocently are driven by the system devised by someone who thinks best, why cant there be a system which ensures that the student learns what he is most interested in [be it multimedia, programing or networking/hardware]

**2. Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?**

Well nothing is fool proof in India at least but yes a methodology can be devised for :

1. The upkeep and maintenance should be on a priority basis every month.
2. The school should make it mandatory to use the Infrastructure to be used by the private partner for training local people or guardians/parents who are mostly unaware of the exact ICT in their kids lives.
3. The PCs should increase the RAM/HDD every 6/12 months.
4. The school should pay extra to the private partner if they can make a School Automation Software [which has happened in West Bengal and about 350 Government schools are now completely on with the database of teachers, students, parents all notices printed in Bengali/English, the service book of teachers maintained and that too they pay for the software once the tailoring is done].

**3. Do you have any insights about the process of setting up ICT infrastructure in schools?**

Yes I have had the privilege to work for such an organisation from 2003-2005 in West Bengal who used to run 400 Govt. or Government aided schools for ICT courses from standard 6-12. Currently I am a consultant to the same organisation for helping them shift towards Open Standards and Multimedia courseware.

**4. Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

Well I think I can as I have already been linked to the education field for a decade and a half although mostly in Higher education/Technical Education/College level and only about 2years with School Education, but am sure to add value with some live situations I have faced in those 2 years of direct interactions and later some interactions which were not on a regular basis.

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## Response 7

**John Mathew, Business Consultant, Kochi**

I'm really glad to see this topic brought out with a lot of importance by the Government of India. Being a business consultant, my ideas revolve around the movement of funds to and from ICT in Education and how the policies will help or deter the same. I also see that there are strong relations between the thematic pillars such as infrastructure and public – private partnership; capacity building and e-content; and therefore the discussion topics may overlap considerably (but this is a subjective opinion).

One of the main issues for large scale deployment of infrastructure is the lack of funds or intermediaries that can channel funds well. I think there should be a policy to allow private funds for infrastructure.

However, I'd like to caution against over - privatization of education and therefore would suggest a cap on the profits that can be taken out of these infrastructure investments. In short, investors interested in ICT infrastructure should look at this opportunity as a stable but low returns opportunity.

Second idea is to involve each school/school district to the product life cycle of computers. Using older machines by corporations have chosen to discard, maybe a cheaper option for increasing infrastructure. Therefore, all machines that are to be disposed have to be certified that they cannot be used by schools. Some policy that will promote this movement of machines to a school would be beneficial (eg. Tax breaks for ICT goods)

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## Response 8

**Anindya Kumar Banerjee, Panchayats and RD Dept., Govt. of West Bengal, Kolkata**

I noticed that one of the most important aspects of infrastructure is missing from the Thematic Pillars – Software- I would like to highlight the importance of software when we discuss ICTs for schools.

Software to be used in the Infrastructure for [ICT@Schools](#)

1) Operating System Software

- XP Home/Professional
- Vista Home/Basic

Or

Open Source if so then

- Red Hat Linux
- SuSE Linux
- Other Linux from Oracle, IBM, Mandrake, Fedora, ????

2) Office Suite

- MS Office or Open Office.org ???

3) Applications

- Based on Programming
- Based on Multimedia
- Based on Networking

4) Should Cyber Law be in the curriculum?

5) Should IT Act be a part as well?

6) Which class should have what as a curricula?

7) Should there be a last Blank semester (which would train on the latest changes in the industry?)

8) How often the OS/Office Suite/Applications be updated?

9) Which DB should be taught and why? (Oracle/DB2/MS-SQL)

10) Should International Certifications be introduced as a "Benchmarking tool" if yes can the cost of Online Exams be lowered for school students?

11) Who owns the License of the software purchased after the BOOT period is over? (as the License can not be transferred in most cases)

12) Who owns the right to the applications/software developed by students?

Let us do some brainstorming over these issues.

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### [Response 9](#)

**Frederick Noronha, Bytes for All, Goa**

[Anindya](#) has brought out a very interesting point. In this regard, I would like to share two links that might be of interest.

#### **FLOSS for third standard students**

<http://divshare.com/download/4053521-61e>

August 2007

*Providers teaching material for 3<sup>rd</sup> Standard teachers in India.*

#### **Taking Sharing to the Class Room**

Paper; by Frederick Noronha

Available at <http://divshare.com/download/3321637-94c>

*Paper informs about Free and Open source software for use in Schools.*

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### [Response 10](#)

**Venu Arora, Ideosync Media Combine, Faridabad**

I just have a small comment, in the discussion on hardware and infrastructure; I would like to share an example that reminds us of the other elements involved.

Example: In a secondary school in Kyunja, close to Mandakini Ki Awaaz Community Media centre in Bhanaj, District Rudraprayag Tehri Garhwal, there are 4 brand new PCs that have been untouched for the past year.

Reason: there is no qualified teacher and despite regular meetings and efforts to convince the school authorities will not let the community volunteers now trained in using computers to start teaching students.

The computer room has become a store room for old and new stocks of books, last I visited I waded through piles to reach the brand new PCs under cover complete with new desks!!!

So, we need to open out the system if there is not enough manpower and there is an urgent need to demystify technology.

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### [Response 11](#)

**Jitendra Shah, Indictrans, Mumbai**

On the topic of Software as a part of infrastructure for ICTs in School, it makes no sense to spend in millions (or will it be billions if we consider the real target numbers) of US Dollars without perpetuity of ownership on the software. Obviously, the heritage of Free and Open Source Software is handy.

Software to be used in the Infrastructure for ICT@Schools

1) Operating System Software

Open Source:

The noncommercial debian: indeed the educational version edubuntu derived from debian will be the best choice.

2) Office Suite

Open Office.org 2.4 with Indian language interfaces and converters for non-Unicode to Unicode (see plugins at <http://indictrans.in/en/OOopluginsWin> )

3) Applications

Based on Programming: java based or other cross platform but 'free' (as in freedom) and open source

Based on Multimedia

Based on Networking

LMS: learning management systems like moodle (<http://moodle.org/>)

Wiki: for curriculum development Curriki.org

CMS: drupal or similar

GIS: FossGIS (see [www.osgeo.org](http://www.osgeo.org) or <http://www.indictrans.in> )

Mobile applications

4) Should Cyber Law be in the curriculum?

Anecdotes may be included in story forms. These may be implying that there exists a legal framework as much as there is understanding of civic and criminal laws in curriculum

5) Should IT Act be a part as well?

Certainly not at school level

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## Response 12

**Michel Bauwens, P2P Foundation, Bangkok**

I have not been participating in this exchange before, assuming it was an administrative/financial discussion.

However, I'd like to share an overview of the resources I have been collating for P2P Foundation, available at this link: <http://p2pfoundation.net/Category:Education>

Some of the material shows the technical infrastructure for learning as well.

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## Response 13

**Anindya Kumar Banerjee, Panchayats and RD Dept., Govt. of West Bengal, Kolkata**

Choosing the right ICT Infrastructure is very essential while planning for projects, find below some suggestions and comments based on my experience in West Bengal [*you can ignore/neglect the names of companies mentioned below but this is what we experienced here in our state*]

1) An option for upgrading the Computers every 6/12 months (i.e. purchasing in lieu of the older version/storage/processor/memory)

2) A stiff clause to set up hardware support service call centres that respond within 1/2 working days or train the trainer to rectify simple errors.

3) Choosing AMD (Advanced Micro Devices) over INTEL as processors, AMD gives a guarantee of 3 years for the motherboard and hence only the processors need to be changed in the next 3 years saving at least Rs.1800-2400/- per PC. Also, internet used by students in School demands for more GHz, which is seen to be best in AMD. Graphics in AMD linked with Nvidia ([www.nvidia.com](http://www.nvidia.com) ) is without a doubt best and on top a neat savings of 1PC for every 6 PCs bought (our own buying experience in the Panchayats & Rural Development, Government of West Bengal). I am sure

you will not think me as a AMD sales guy but the truth is what we explored while procuring for our Gram Panchayats in two recent tenders on RGSY & BRGF where we procured 532 (Dell PC) and 310 (HCL PC) + 100 (Dell PC) respectively nearly 800nos.

4) It has been a practice that the schools are provided with inkjet printers but Laser printers are cheaper and better than inkjet printers (we procured HP LaserJet 2014 bearing market/street price of Rs.13500/- for Rs.4900/- unbelievable please believe me, my department says it is my negotiation skills and my being in IT for last 17 years)

5) Lastly I recommend using alternate source of power. We have had the privilege of talking to the great personality Sri. Kunwer Sachdev Managing Director of Su-Kam ([www.su-kam.com/solar-products.html](http://www.su-kam.com/solar-products.html)) who are the leaders in exporting Solar equipments. In Rural Bengal, they have close to 360 service centers, which no one could match, and they give a written 3 hour service guarantee. We are in fact floating an EOI (Expression of Interest) shortly for the 2% villages where there is no grid power and never will be as these are coastal areas like Sunderbans, Gosaba and some forest areas.

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#### **Response 14**

**M V Ananthakrishnan, Developmental Infomatics Lab, KReSIT, IIT Bombay, Mumbai**

All my observations/suggestions are based on a two-year study carried out in six schools in rural Maharashtra. The author led the project, implemented by IIT Bombay (IITB) in collaboration with Vigyan Ashram, Pabal and with financial assistance provided by Media Lab Asia, Ministry of Information Technology, Government of India

**What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure? Are there any good examples where these challenges were overcome?**

Some of the major challenges faced can be broadly divided into

1. schools already having computers/hardware/software/courseware, and
2. schools yet to go in for computers or yet to use them in real earnest and each one needs a separate treatment and analysis

The common issues of concern are:

1. Seamless Integration of new technology with the existing and well-proven classroom techniques
2. Unreliable power supply
3. Timely maintenance of faulty equipment
4. Old/reconfigured computers donated by industrial houses
5. Appropriate training/orientation of teachers
6. Accommodating computer time within the normal school schedule
7. The end-users (students) being absent in the decision-making process

The solutions are aplenty, as suggested, recommended and implemented by NGOs, vendors, corporates (as a part of their Corporate Social Responsibility) and voluntary bodies. But, in each, the motives are self-centred, rather than benefiting the end-user (the student). Vendors send their marketing professionals, who sell “products” and not services, education being one. Such missions have strings attached in the form of setting up and maintaining a network of computers and supplying courseware, invariably syllabus-based. The deals are mostly settled with the management of the school, the teachers being often not included and the students never in the picture. Vendors rarely include teachers in their marketing team.

Issues (2) and (3) have been partially obviated by using UPS/inverters, again dependent on maintenance. Issue (4) is a perpetual problem, involving speed for multimedia applications. Issue (6) still remains...partially addressed.

#### **Personal Examples: (from the Rural Schools Project)**

The issues (listed in the earlier paragraph) addressed and implemented were (1), (2), (5) and (7). The methodologies used were, respectively for each issue:

1. Creating a repository of off-the-shelf courseware, and correlating each section of the prescribed subject (science & maths) with the corresponding coverage in the courseware; adding value to it by referring to appropriate websites and free downloadable courseware. Off-the-shelf courseware were provided as a part of the project

2. Providing each of the schools with one new multimedia computer, an inverters/UPS (not a complete solution). Each school was to match the grant by providing one multimedia PC
3. Conducting a series of workshops for teachers on (i) integrating courseware with classroom teaching; (ii) teaching methods and their relevance to adding value to knowledge; and (iii) using tools to develop additional resources. Awards were given to the two best teachers during the workshops in each of the schools.
4. Demo lessons were conducted, using courseware, for the students in order to make them realise the value/knowledge addition to classroom teaching. Further, they were shown how courseware could become sources for revision of classroom lectures and, sometimes, classed missed.

**Can you suggest creative ideas and innovations for using ICT infrastructure and for its upkeep?**

A website has been created that provides the teacher/student with a section-wise link of the science syllabus and the social studies syllabus of Class VII with relevant sections of courseware, websites and free software. The website is available at the following link: [www.shiksha.dil.iitb.ac.in](http://www.shiksha.dil.iitb.ac.in)

**Do you have any insights about the process of setting up ICT infrastructure in schools?**

The website, [www.shiksha.dil.iitb.ac.in](http://www.shiksha.dil.iitb.ac.in), could be used by schools, teachers and possibly, students, to enrich the contents of the website, share ideas, solve conflicts and pose problems.

**Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

1. Yes, there are ways by which the school facility could be made use of by the community at large. Among them are:
2. Adult Literacy Programmes, using the TCS' CBFL Package (of which I was also the Leader of the Development Team)
3. Computer Literacy for unemployed youth, making them employable
4. Computer usage for elders and womenfolk to help them keep records, save ideas, save designs and distribute knowledge and wisdom
5. Cyber-cafes for people to send emails, take photographs/printouts and get local newsletters/invitations/brochures prepared by local youth and...legal phone calls. Students and teachers could use them to surf and get valuable add-ons to textbook information.

**Response 15**

**Srinivasan Ramani, International Institute for Information technology, Bangalore**

**What are some of the key challenges faced using ICT in school education with regard to ICT infrastructure?**

1. Uncontrolled access to the Internet for all students is very expensive
2. Satisfactory Internet access for the students in a school is difficult to provide in most areas of the country outside the big cities
3. The Internet in schools poses problems of misuse (like visiting educationally useless and undesirable sites)
4. Attempts to use ICT in education are relatively ineffective unless the student gets content in his/her own language and content relevant to the curriculum. Suitable and adequate content should be planned for when the physical infrastructure is planned. Educational TV offers the raw material for computer based video and multi-media instruction in Indian languages.

Local Area Networks (LANs) are very important for educational institutions, particularly because Internet access is a problem. If content is available for hosting on the LAN, it would play a valuable role. Ideally a good part of the content should be in the video form. Interactive multi-media material would also be valuable. We should make such resources available over every school LAN, instead of trying to make them accessible over the Internet. The bandwidth required for these is quite high, and the LAN is the cost-effective solution to provide this bandwidth. This will overcome many of the problems listed above.

I have a few other suggestions in relation to infrastructure. India has excellent satellite TV infrastructure and has invested significantly in educational TV. Due to technical advances, a school can now spend only Rs 2500 on DTH equipment once to get a 1.5 Mbps digital link (that is what satellite TV uses), which in turn brings video content for free. Some Indian educational channels are planning to switch to DTH soon, and it is very practical for them to do this.

Due to the rapid fall in the cost of servers and storage, it is entirely possible to record in digital form into a server thousands of hours of TV programs, and make it available on demand from every PC on the LAN. It is easy to make a

specified program available over the LAN according to a schedule to as many classrooms and PCs as are required. We can simultaneously provide for any set of Classrooms/PCs to access programs that are required individually, without depending on a time schedule. A digital library on a server on the LAN would be a valuable asset, as it will store all types of digital content.

ICT is perceived as expensive. It need not be so, if a PC and a projector are used for a class as a whole. Such a facility should ideally be available in every classroom. The classroom PC-cum-projector facility can be used even to administer quizzes and tests. Objective type questions can be displayed on the screen and students can be asked to write down the answers. Alternatively, the teacher can call out students at random to answer a given question for the benefit of the class. The teacher can correct wrong answers, explaining why that answer was not the correct one.

**Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

I believe that the most useful way would be to have a trained person there after office hours to offer training on the use of the PCs and any available Internet connection to interested people in the local community. We need to train several million people at that level, and trainers working out of school facilities can easily run a sustainable training program. People will pay a lot more for training and education than for mere access to hardware and software. We will need several hundred thousand trainers to do this work. Therefore a big project in this direction will create a large number of valuable job opportunities for teachers and others. These opportunities will arise wherever there are schools in India.

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**Response 16**

**Anjela Taneja, ActionAid, Bhopal**

1. My first thought was a question: Is this policy supposed to apply to computer education for all schools in the country, or intended to be applied selectively for private and/or elite government schools (KVs, SVs, schools in district HQs and above). The infrastructure constraints would be dependent on that. My sense is that a policy should apply to ALL schools; however, this raises a whole range of other questions.

2. What mode of funding do you visualise for ensuring that a relative degree of equity is ensured? I assume an element of PPP is being envisaged; I have serious reservations as to the degree PPP would be able to reach the most interior rural areas and would be enough for ensuring operation on a massive scale (to cover the entire country). PPP undertaken from philanthropy or tax saving wouldn't be enough to ensure investment on this scale and no business can forego the need to produce some return on the investment made which would translate into increased user fees for schooling. Lets not forget that a large number of schools still lack basic (and cheaper) facilities like blackboards, books and charts. There is also the challenge of where we are starting from- currently only 13.43% schools have computers (how many of them are used, and used by children is an even smaller share) (all figures, latest District Information System for Education (DISE) data). If the government has to pay for it, they claim they don't have the money to supply these basics- private sector wouldn't fund anything on this scale either without user fees or demanding government subsidy.

3. There is the relative question of cost. Currently the total cost for all the teaching learning material is Rs 500 per teacher (amounting to Rs 1000 per school for a school which isn't a single teacher school). Even if we adopt the one laptop per child model and apply it as one laptop per SCHOOL, this is 120 dollars= 6000 Rs per school (6 times more). While I don't deny that computer education is essential, one needs to make sure that the investment in computers for some elite schools doesn't happen at the expense of funds for the very very basics in the rural schools (which lets not forget form the majority of schools in the country by a huge margin).

4. Electrification: 85% of India's villages appear to be electrified at this time (read 15% villages where we are potentially considering setting up computers don't have electricity; whether the electricity has reached the school, works during school hours is a different issue or comes at a steady and right voltage are all different matters). The % schools effectively without electricity is likely to be much higher. UPSs aren't a sustainable solution since they cannot be recharged and are difficult to maintain if something goes wrong in interior areas. Generators are prohibitively expensive.

5. Teachers: 12% schools are single teacher schools. 16% schools have more than 60 students per teacher (rising to 67% in Bihar for example). 5% schools have 1 teacher for 100 children. My point here is before we talk about teachers trained in ICT, we need teachers period. Computer education requires a certain amount of individual instruction and on-machine time. However, this is difficult to maintain at the kind of pupil teacher ratios present in India at present. And lets not forget atleast 1:10 teachers in the country are parateachers- untrained and underpaid.

6. Now what I am saying is not that the challenges are insurmountable. There are islands of excellence of computer programs working on a small scale. However, these are usually in better off schools (more teachers, closer to the highway, village fully- not partly- electrified, financially better off community, or where there is a motivated NGO). The challenge is to ensure children in areas without adequate teachers, in interior areas, in villages with not enough

electricity, whose parents are poor and without NGOs/having a committed corporate in the vicinity are not deprived of opportunities which are available to their luckier counterparts. I am introducing a note of caution saying that the successful case studies that are usually cited are often not representative of the reality in rural schools but are introduced in the schools which are the best functioning anyway (better infra, more motivated teachers, actual parental demand from an active panchayat/better off parents etc).

7. In my view, it all boils down to money to ensure that all the 11,96,663 schools presently in the country are not denied atleast some opportunities for computer education through largely government funds. I am, however, far from sure there is a will on the part of the government to achieve this task. Consequently, some amount of costing would ideally need to be done along with the policy to make sure that the government is ready to back this with resources. Too many great policies flunked since the government simply didn't have the money for it (the Right to Education Bill comes to mind; if we are talking universalisation of ICT in schools that may need to be built into the CAFE norms of schools- just a random afterthought).

8. Additional points, IT infrastructure upkeep. I have seen far too many computers that have become unusable in a couple of years. This is usually largely because the materials are made available under some scheme or through an NGO, and its maintenance stops after the project period is over. A grant for maintenance would need to be built into the SSA to ensure that it is relatively universally available and sustained. Of course, this raises the question of finances after the SSA period.

**Can you offer advice on ways in which school ICT Infrastructure can be used as community learning centres after the school hours?**

After school hours use. Well, one idea would be to link it up to e governance and other such initiatives. However, the question of maintenance still remains- computers that are shared usually have a lower life. at the same time, it would only be available after like 5 PM when the school has been fully closed by say 4 PM. That doesn't leave much time. A random possibility is linking up to continued education for adults. However, the experience of adult education in villages has been even worse at present than it is for school education. Linking up with processes already in place in that particular village would be essential for the system to work.

Whatever requirements that a particular school has in terms of ICT or otherwise should in theory be fed into the school micro plans that are supposed to be prepared under SSA. This process is currently being followed more as a formality. A challenge would be to active the process through empowered Panchayats and ensure that ICT budget heads are introduced in the plan.

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**Response 17**

**Anindya Kumar Banerjee, Panchayats and RD Dept., Govt. of West Bengal, Kolkata**

I understand that much has been written about the important issue of deciding on our children's future related to education and literacy in ICT, I request all to think more logically and humanely rather than impulsive thinking as it is our own people we are talking about.

I somehow have been close to [ICT@School](#) not only in the East but also at Madhya Pradesh, Chhattisgarh, Bihar and Jharkhand by some means or the other and have a lot to share in this forum of learned people who are trying to come to a conclusion for the FUTURE of INDIA.

I am sure the 7 Thematic Pillars made will stand good enough like the 7 Colors, 7 Wonders, 7 Sur, 7 seas, 7 Continents one day.

I strongly feel that this exercise was required for the best understanding of the ICT@School project being thought about by MHRD. I am sure that all members will agree to:

1) ICT Infrastructure should be dynamic giving it a face lift every 6/12 months in parallel thinking about using the older PCs in training students about hardware/networking as older machines may not be ignored as far as processing is concerned.

2) PPP is must with a single partner across a state to keep uniformity or else choose the same curricula for all schools across the country.

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## Response 18

### **Binay Pattanayak, National Technical Support Group (SSA), New Delhi**

I am impressed by the number of participants and their different suggestions. I am going to share little information about the initiatives undertaken under Sarva Shiksha Abhiyan (SSA) to strengthen Computer Aided Learning (CAL) in collaboration with a number of private organisations those who working on Educational Technology.

Under the SSA it is planned that use of Information and Communication Technology (ICT) and computers in the form of CAL may help in achieving the said objectives. Keeping this in view, a component of computer education was kept under the Functional Head of 'Innovation' in the framework of SSA. Under this component there is a provision of Rs. 50 lakh (Rs. 15 lakh till 2007 - 08) per district per year available to the States for CAL. Under this programme Public Private Partnership (PPP) is encouraged. To facilitate such partnership, four workshops with the State Project Directors and the representatives of private firms have already been organized.

Some of the examples of Public Private Partnership under this programme are as under:

- The States of Andhra Pradesh, Rajasthan, Orissa, Uttar Pradesh, Bihar, Nagaland and Assam have adopted a BOOT (Build on Operative and Transfer) model. Private firms have been given the responsibility to install hardware/software and provide approved e-learning material and teachers training for a fixed period, mutually agreed upon.
- In Delhi, the Earnest and Young Foundation has offered to voluntary support the pilot phase of Education Department of NCT of Delhi's efforts to introduce a complete set of animated learning and study material called CALtoonZ. This has helped for innovative learning and teaching practices in the schools of Delhi.
- The Rajya Shiksha Kendra, Madhya Pradesh in association with Bhoj University has developed interactive lessons for students at Elementary School level in Video CDs titled 'Headstart' in Hindi. These CDs are also being used by other Hindi speaking States in the country.
- In Uttarakhand and Tamil Nadu, training on CAL has been done in partnership with Microsoft.
- Teachers' training is being imparted with the help of HARTRON in Haryana, INTEL in Gujarat, Himachal Pradesh, Kerala and Tamil Nadu.
- In Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, Gujarat and Orissa, Azim Premji Foundation has been associated in developing Computer Aided Learning material.

More than 50,000 primary/upper primary schools covering good number children have benefited under CAL component of SSA during the year. Department of School Education & Literacy, MHRD with the objective to strengthen the CAL programme, some time back constituted a Committee for formulation of Guidelines for Computer (IT) Education under SSA at elementary stage. The Committee, in its report has deliberated on the national and international status of CAL at elementary and primary level, suggested interventions for CAL under SSA, provides estimates of population which needs to be covered under the programme, the level of infrastructure and hardware needed, analysis of available resources, possibility of mobilisation of additional resources and strategy for implementation of the programme.

- The main interventions required for introduction of CAL and making use of ICT in Elementary Education, are training of the teachers, creation of infrastructure, development and production of State specific e-teaching/ learning material in local language and sensitisation of the State-level statutory bodies like Board of Education and SCERT. The first tier is for training of teachers and necessary sensitisation of States and their statutory bodies. The second tier suggested included creation of infrastructure, development of e-teaching/learning material and formulation of scheme for making available additional resources. It was suggested that pending formulation and approval of the scheme to mobilise additional resources, the available resources may be utilised for CAL and use of ICT in elementary education.
- Role of private sector is also considered equally important in not only implementing CAL in elementary stage but also for mobilizing additional resources.

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## Response 19

### **Anil Prasad, Finance Department, Government Secretariat, Kerala, Thiruvananthapuram**

Find below my comments on infrastructure:

### **Physical Infrastructure**

- We should keep in mind that we are not supposed to start from ICT Infrastructure but from the overall infrastructure of each institution. The question we should ask is whether suitable physical infrastructure is available to upkeep the ICT Infrastructure? Therefore standardisation of these physical requirements (minimum) should be done first and institutions may be surveyed against such standard physical infrastructure requirements needed for ICT infrastructure.
- Categorize the institutions based on the survey and formulate different strategies for each category.
- In the case of institutions require physical infrastructure, prepare a plan to coordinate with other potential agencies like Local self-government institutions (LSGIs), NGOs etc to build the physical infrastructure with minimum time.
- In areas where electricity supply is not feasible in immediate future alternative ways may be explored.

### **ICT Infrastructure**

- What are the minimum ICT equipments required at each level of institution? What should be the configuration of equipments? Always updated documentation is required in this respect.
- What is purchase/supply plan? It should be made very clear in the plan.
- What is the maintenance plan? Annual Maintenance Charges? – Continued support service after warranty/guarantee period may be linked to some self employment programmes – that is; we have to prepare a collaborative development plan.
- What is the network connectivity plan? Here also the Virtual Class Technology on Edusat for Rural Schools (VICTERS) project in Kerala can be taken as a model <http://www.victers.kerala.gov.in/>

### **Manpower**

A suitable programme may be launched to train all the teachers in basic ICT including awareness on hardware upkeep (the models like IT @ School project in Kerala can be replicated <http://www.education.kerala.gov.in/itschool/index.htm> )

### **Community Learning Centres**

The ICT infrastructure in Schools can effectively used for community learning. Priority may be given to the family members of the students so that it will better the study environment of the students in their homes. Teachers may take-up this assignment on rotation basis, so that it will become an ideal demonstration of volunteerism for social service. The relationship between the local community and the institution will also strengthen by this.

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