

## **Final Research report**

on

**A study on the potential adoption of e-learning on portable mobile devices and its impact on wireless broadband usage**

By

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## 1. Introduction

Advancement in technologies, and competition have made various wireless access methods available and affordable to the consumers. Though the Government has auctioned airwaves for 3G and BWA deployment, applications that use the high available bandwidth are still missing. Information Technology has made inroads in higher education for improving teaching and learning methods. Classroom learning has gone global, and most branded schools have been experimenting with Internet technologies to provide admissions, teaching, and examinations on line. But the penetration of such technologies still remains low and limited. Many schools offer computer mediated learning in classes though the full potential of the technologies have not yet been explored. E-book reader paved the way for a new type of device, that is designed to meet the user requirement in terms of better visual experience, mobility, connectivity, and application content. Seeing the success story of iPad, many major PC and laptop manufacturers and mobile device vendors such as Samsung, and RIM, have entered the Tablet market. Tablets with their Internet connectivity through the ubiquitous Wi-Fi local access service, and their appropriate form factor to view e-books and e-journals have started revolutionizing reading with enhanced user experience. Many countries encourage computer usage through programs such as the One LAPtop per child (OLAP). Recently the Ministry of Human Resources have initiated a nation-wide education programme for schools using the \$35 Tablet device.

The following figure illustrates the evolution of eReaders and their price points globally:

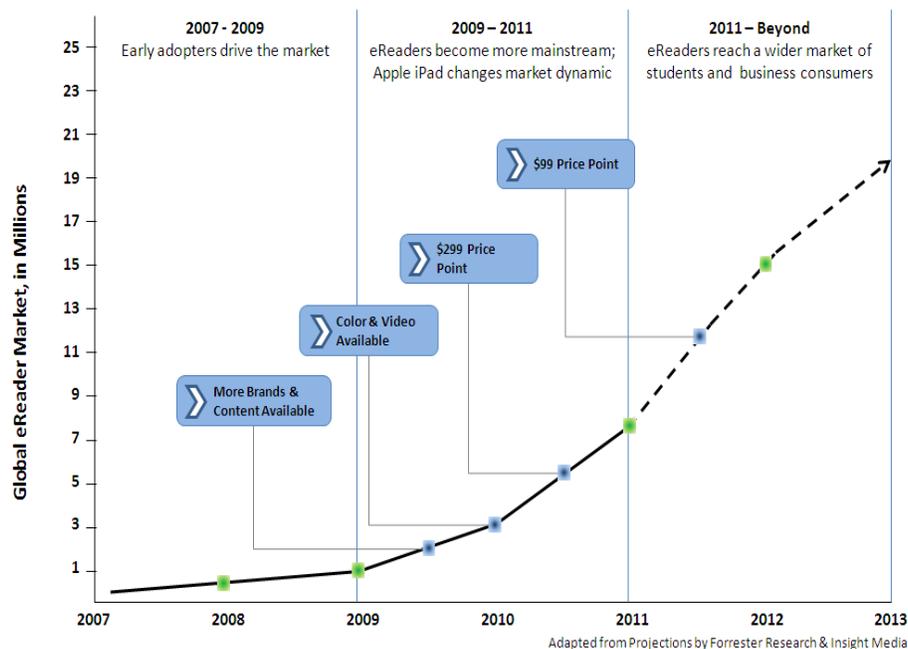


Figure 1. Evolution of the eReaders

Based on these facts, the objective of this research project is to analyze potential adoption of e-learning through mobile portable devices. It is our intention to find out whether such Tablets with e-book reader capabilities can be used for improving education in the schools. With the adoption of such devices there is a possibility of reducing burden of weight on children, improving leaning habits, enlarging scope of the reading content and enhancing in general the learning capabilities of school going pupils. The current research aims to look at the adoption both from the viewpoints of Institutions as well as students.

## **2. Current e-Learning models and associated gaps in the ecosystem**

Adoption of e-learning in schools and colleges has been slow in India compared to other countries. Companies such as Educomp and Edurite have made some progress in providing educational content to the schools. However, the lack of widespread adoption of e-learning can be attributed to the following:

1. Deployment of e-learning in schools is mostly done using a top-down approach. The service providers and device makers force their solutions to end users without a complete understanding of the requirements of the teachers and students.
2. Examinations are conducted still using paper and pencil and may prove to be a barrier.
3. Teachers may have concern regarding the appropriateness of the content and its suitability.
4. Fully integrated service offering providing content, training on the usage, maintenance and upkeep of content are still missing.
5. Internet connectivity is still not adequate and more often non-existent in most of the schools.
6. Most of the schools consider that e-learning needs separate computer labs hence perceive implementation cost to be too high.
7. Lack of E learning device with appropriate content

### ***2.1. Comparison of print media and e media***

Following are the observations made during our interactions with students and teachers regarding the advantages and disadvantages of e-media when compared to the traditional print media:

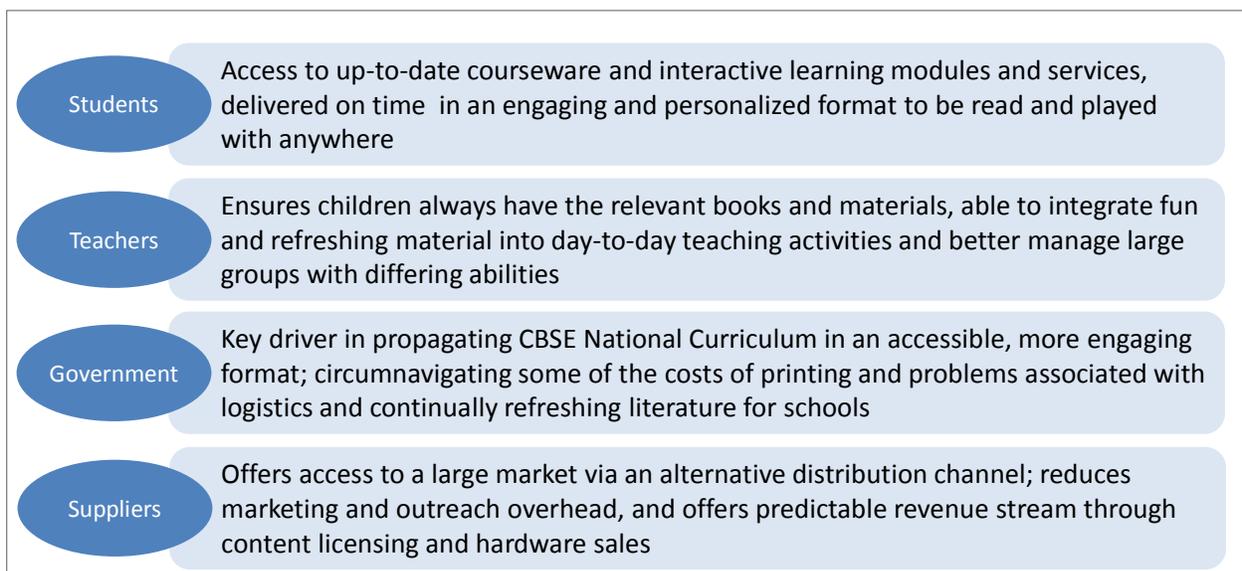
- i. Print media such as books, paper magazines provide complete view of the subject whereas e-media provides limited view.
- ii. On most occasions, advertisement in e-media blocks the content and hence deteriorates readability. However, advertisements in print media occupy separate space and do not hinder reading of the content.

- iii. Advertisement in print media is static whereas in e-media it is dynamic and eye-catching. For advertisers e-media provides a better option for getting “eye balls”.
- iv. Typically, the content including pictures are two-dimensional in print media where as it can be 3-dimensional with animation in e-media, thus providing richer information.
- v. Relatively higher cost of e-media sets barriers to user adoption compared to the lower cost of print media.
- vi. Parents and teachers can restrict certain type of content relatively easily in print media compared to e-media.

Based on the above we summarize the potential benefits of adopting e-media on portable mobile devices for schools:

- i. Explanation of subject content using animated examples.
- ii. Enabling students to be exposed to technology and making them feel comfortable at using them.
- iii. Conduct of online exams and assessment to improve students’ performance monitoring
- iv. Easy and timely upgrade of content and study material for both students and teachers.
- v. Reduction of the burden of books of school going students.
- vi. Enable any time anywhere learning environment and hence provide flexibility to students.
- vii. Facilitate the Continuous and Comprehensive Evaluation (CCE) being adopted by the CBSE board.

In addition, the government and associated suppliers of eBooks and eReaders will also benefit as given below:



**Figure 2. Benefits to various stakeholders due to adoption of eBooks and eReaders in schools**

### 3. Methodology used

From the initial study of education system in India, the schools belong to different categories are illustrated in the following figure. Most of the government funded rural/ urban schools are at the bottom of the pyramid. Primary education is the main focus in these schools and the books are provided to the children for free at government cost. Many of the government sponsored/ subsidized schemes such as mid-day meals and free uniforms are supported in these schools. Above this category is where most of the private schools play their roles. These schools offer additional facilities such as computer education, education through electronic media, providing school buses for a fee. Many times they also print some additional books and print material along with prescribed curriculum. The top-tier private schools are mostly located in large cities and typically follow advanced educational systems, typically an internationally accredited curriculum. They provide additional advanced sports facilities, provide international exposure and more advanced electronic media support. Many students in this category of schools are very much exposed to electronic devices and their parents can afford e-educational tools and content.

Student in these schools can be categorized as per learning complexity and exposure. They can be classified as 1- 4 grade where students learn basics of the subjects and have limited exposure to internet and devices. Parents may have apprehension to give electronic devices them. But they are very fast learners. Grade 5 - 8 where students have some basic knowledge on Internet and devices. Grade 9 - 12 students learn advance subjects, use labs to experiment and have adequate exposure to Internet and associated devices. Parents may have less apprehension to give electronic devices to these students.

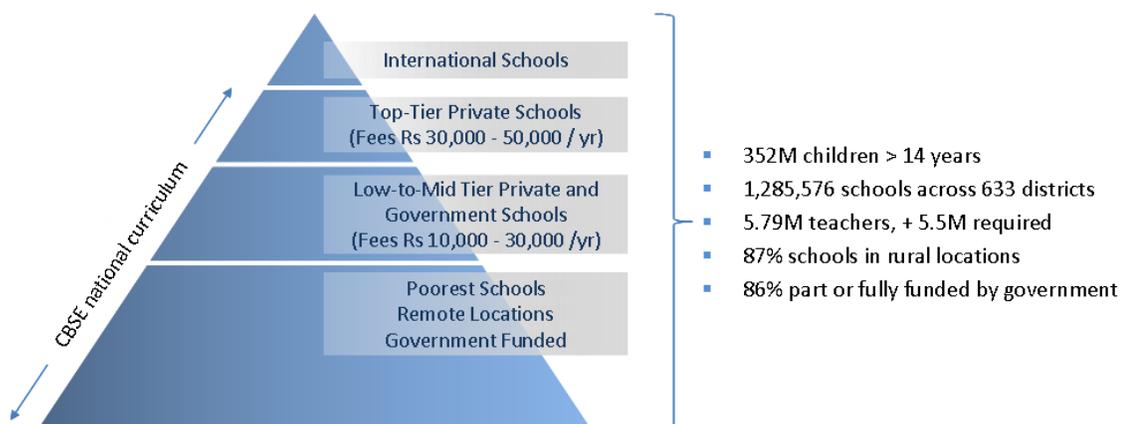


Figure 3. Typical category of schools in India

From our initial study, the average cost of books/ notes is about Rs. 10,000 per year per student in the mid-tier schools. This is well within the price of a low-cost e-book reader including maintenance costs for three years. Many school chains that adopt CBSE standard (e.g. Kendriya Vidyalaya, National Public School, Delhi Public School) belong to this category. Hence our survey study was conducted for both the teachers and students in select groups of CBSE schools cities of Bangalore and Mysore in the state of Karnataka. The student participants for the survey belong to grades of 8<sup>th</sup> and 10<sup>th</sup>. The objective of the survey was to elicit responses from both students and teachers about their requirements in e-book readers for supporting their curriculum.

Two versions of the survey questionnaire: one for administration to students and another for teachers, were developed and are provided in Annexures I and II. In particular, the survey was administered to capture the following:

1. Teachers and students extent of exposure to electronic devices including mobiles and computers
2. Reason for which Computers are used in classes
3. Teachers' view on e-learning requirements
4. Exposure of students and teachers to portable devices
5. Major obstacles for the usage of technology products in school - students' view
6. Concerns on the usage of technology products in school - teachers' view
7. Students' wish list on features they expect in portable devices
8. Teachers' and school administrators' view of the current ecosystem in the e-education space and gaps.

#### **4. Survey findings**

The surveys were conducted in group of schools that have CBSE curriculum in the cities of Bangalore and Mysore. Totally about 90 students and 15 teachers were interviewed and survey responses were collected. The gender ratio of male: female in the study group was about 60:40.

##### ***4.1. Exposure to handheld devices and associate technologies***

From the survey it was observed that most of the students and teachers are average technology users. They are aware of latest technologies in the tablet and mobile markets. Some of them have even access to i-pad and Samsung Galaxy tablets. They are familiar with email usage, internet search, and social networking. They are also aware about application stores such as i-store and the Android market place. Most of the students and teachers have used handhelds such as music players, mobile phones,

smart phones, laptops, and gaming devices. Most of these devices are battery operated and have delicate touch screen. This exposure shows that users are conscious of operating portable devices carefully and optimally under battery capacity constraints. Following figure illustrates the participants' exposure to handheld devices.

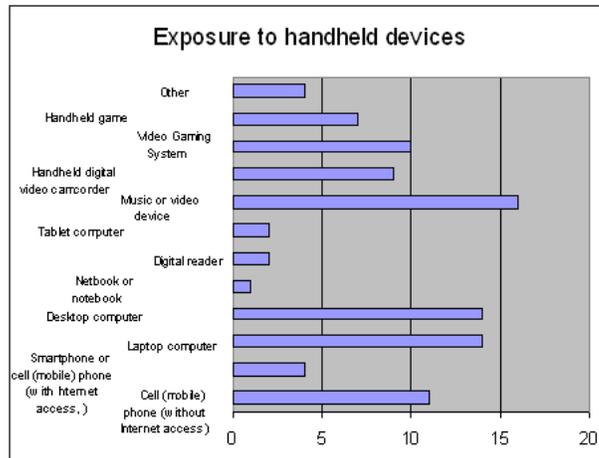


Figure 4. Exposure to electronic devices

#### 4.2. Technology usage:

Students and teachers who we have surveyed have experience in using computers either in the form of desktop or laptops. Following chart captures the use of computer based applications for school work. Notable ones are accessing schools portals to find out about the upcoming events in the school, and to check on class and school announcements, and to check their grades. Some students use computing devices to completing assignments. This includes finding additional information and content for their class assignments. Some students have been using the computing devices to create slide shows, preparing for seminars, and speeches. Few students have taken online competitions. Many of the users are aware of social networking and participate in them for personal chat or for sharing some school information.

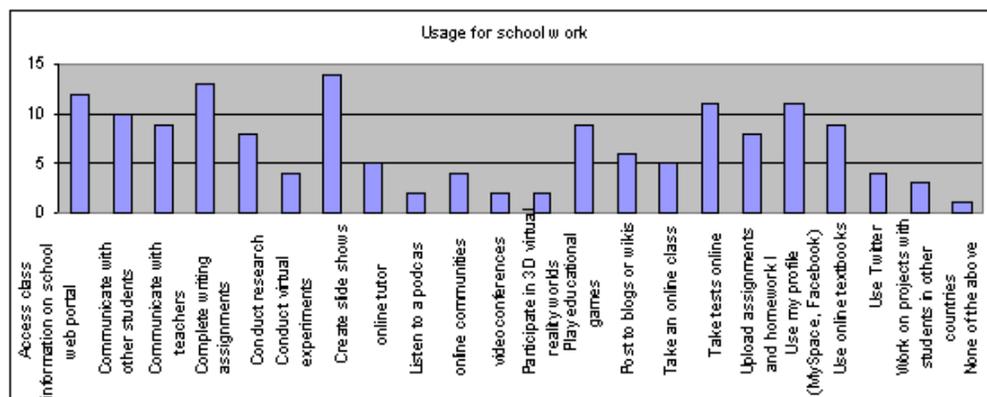


Figure 5. Computer application

4.3. Expected usage of portable devices:

Following chart displays the expected usage pattern of the survey participants, especially as it relates to school work. It was observed that students show more interest in using device for accessing online textbooks, play educational games, take notes in the class, and for doing project work.

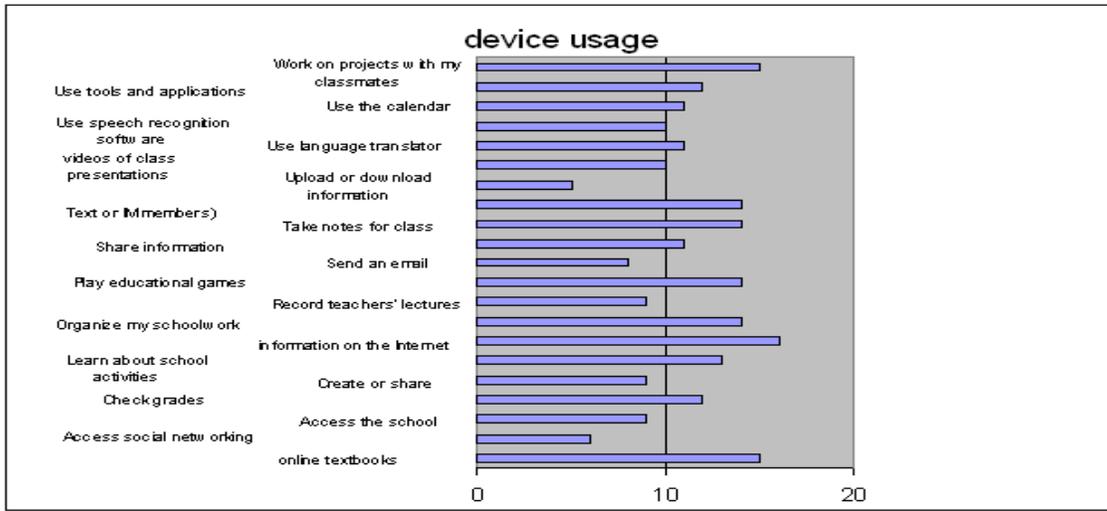


Figure 6. Students' expected usage of portable devices

Whereas Teachers indicate they will be able use portable devices to share exemplary work of students, to provide instant feedback, to access homework and assignments, and to provide supplementary course related information.

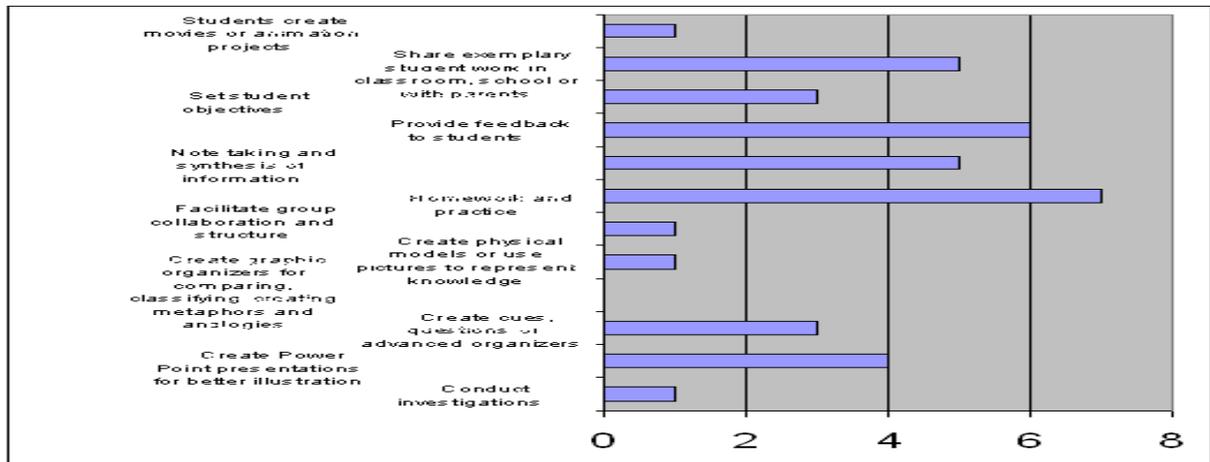


Figure 7. Teachers' expected usage of portable devices

#### 4.4. Major obstacles for the usage of technology devices in school:

Even though students are interested in using technology in schools, the environment may not be conducive. In our survey we found out that students and teachers face issues such as the personalized devices not being allowed inside the classes, schools have limited computers, and have poor Internet connectivity.

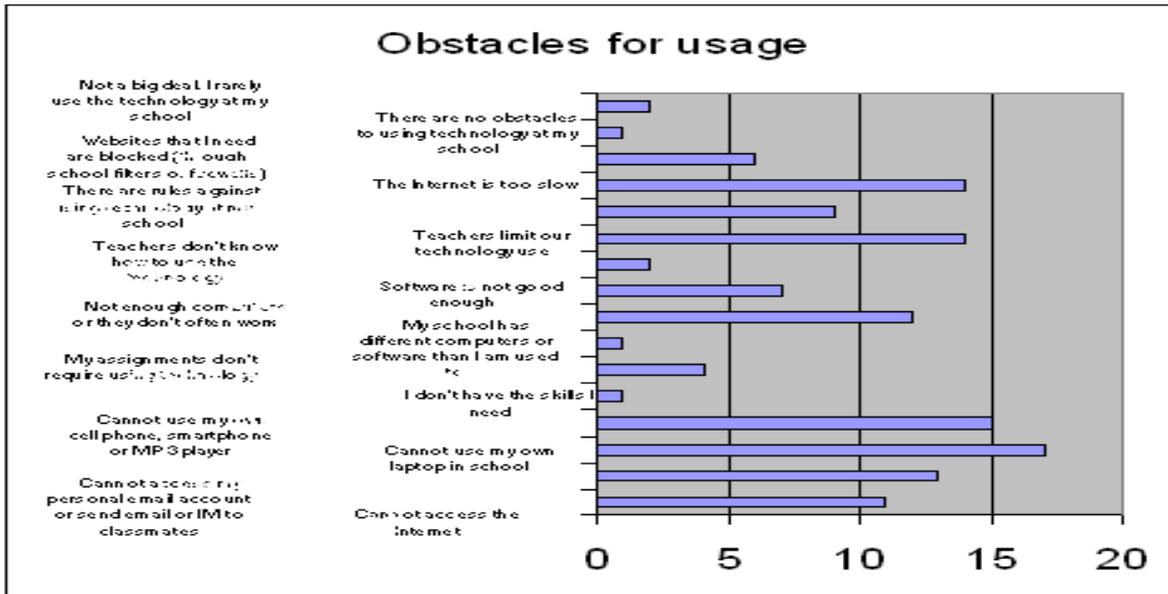
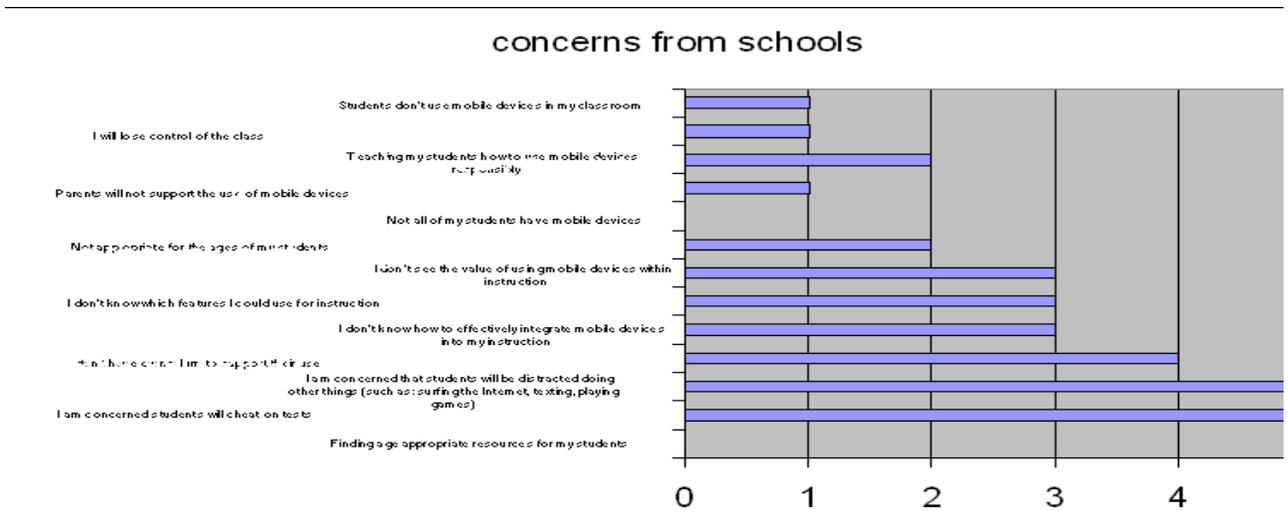


Figure 8. Obstacles faced by students on the use of technology devices

Some of the concerns of teachers (as given in the following figure) are based on their experience from mobile phone usage in schools. Teachers are concerned that students may cheat using electronics devices, and may be distracted by accessing Internet and games. They voiced their concern that they did not have curriculum to support, and effective ways to integrate and manage these devices. These concerns can be categorized as those related to access policy management. By having an appropriate policy management many of these concerns can be overcome.



**Figure 9. Concerns of the teachers for use of portable devices in schools**

In general, usage of electronic device in Indian schools has not gone well. Due to some abusive behavior exhibited by some students, many schools have banned mobile phones in the classroom. They have other concerns and issue with respect to usage of web enabled devices. Similarly students have also have expressed their concern on web enable device and web service.

In the survey, students were asked about issues faced by them while they are on-line. Results are tabulated in Figure 7. The concerns are also given in the Table below:

**Table 1. Concerns of students being online**

Concern	Percentage of responses
Spending more time with web	70%
Approached by strangers	50%
Students using device to cheat	50%
Viewing inappropriate website	45%
Sharing too much information on website	40%
Stranger asking personal information	35%
Online harassment	35%

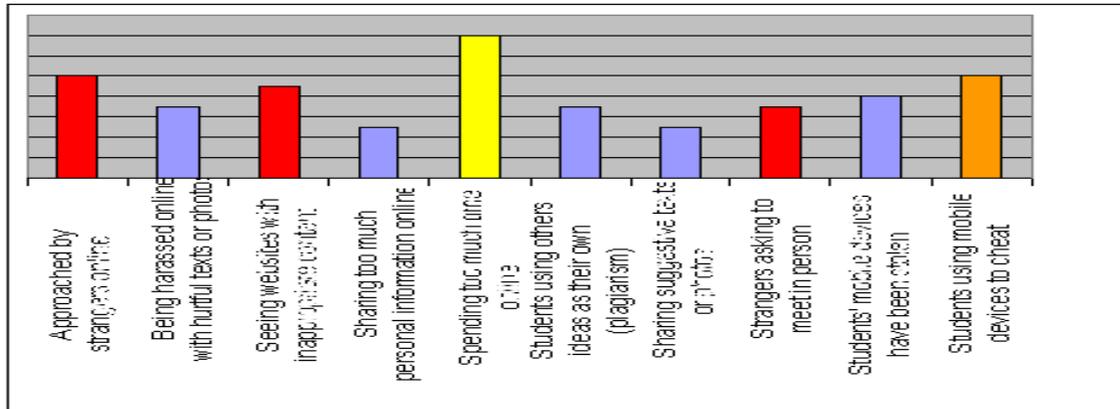


Figure 10: Students' view on problems being online

Teachers also have similar concerns when their students are online. The major issues are spending too much time in web, seeing inappropriate web sites, sharing personal information and being harassed online.

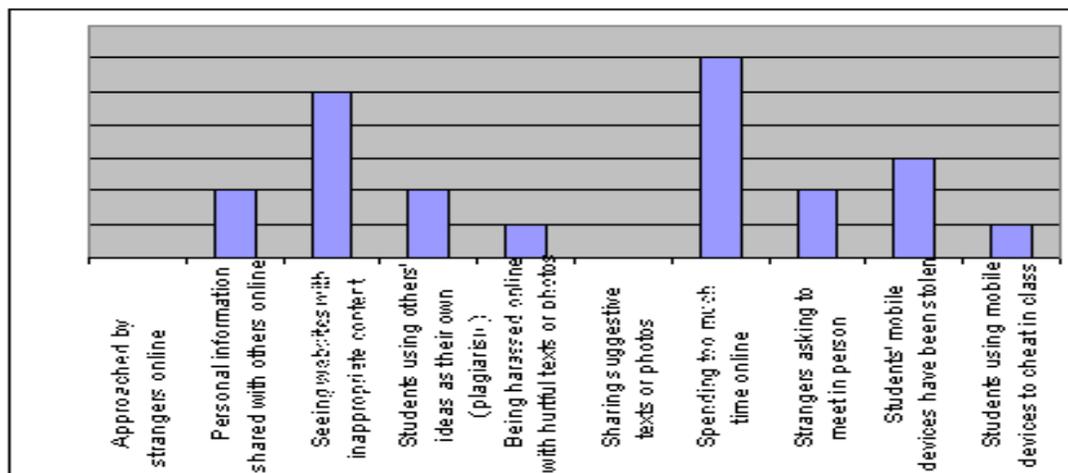


Figure 11. Teachers' view on students being online

The above concerns can be suitably addressed using a policy based security enabled solution.

#### 4.5. Students' wish list

Assuming that the policies can overcome the concern expressed by school administrators and teachers, and devices are made appropriately to support students' concerns, the survey brought out the wish list from students and teachers. Students were then asked to list their preferences on what they want in a 100% online text books. Many interesting requirements were listed. This includes highlighting notes similar to how it is used in printed books, addition of animations to make it easier to learn concepts, dictionary support for many languages, tools to improve writing skills such as providing puzzles, important clues for examination, and provisioning of reference material. Many of these can be

addressed by providing software and educational content in the devices. Figure ?? illustrates these views.

Subsequently the students were asked to list ways to making science learning more interesting. Many suggestions were provided , and some of the requirements are listed in Figure ?. Students expressed that they would like to visualize conducting lab activities. They would like to use animations to learn experiments in Physics and Chemistry and conduct investigations in Zoology and Biology topics. For example, use the Periodic table to conduct virtual tests such as mixing of two chemicals and seeing its effects.

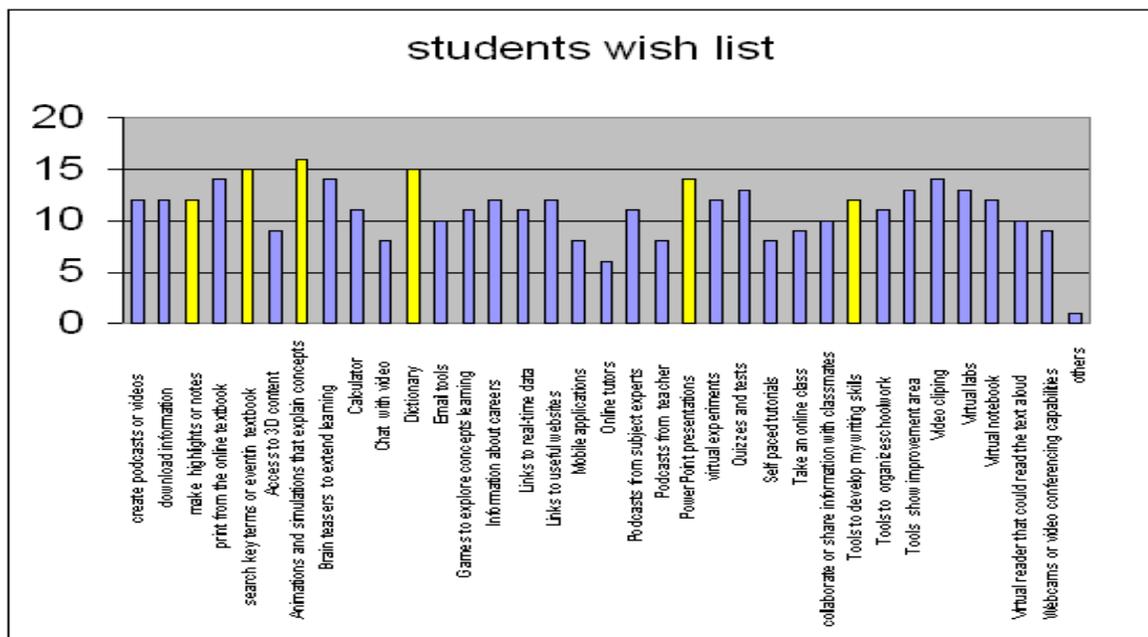


Figure 12. Students' wish list of features in online text books

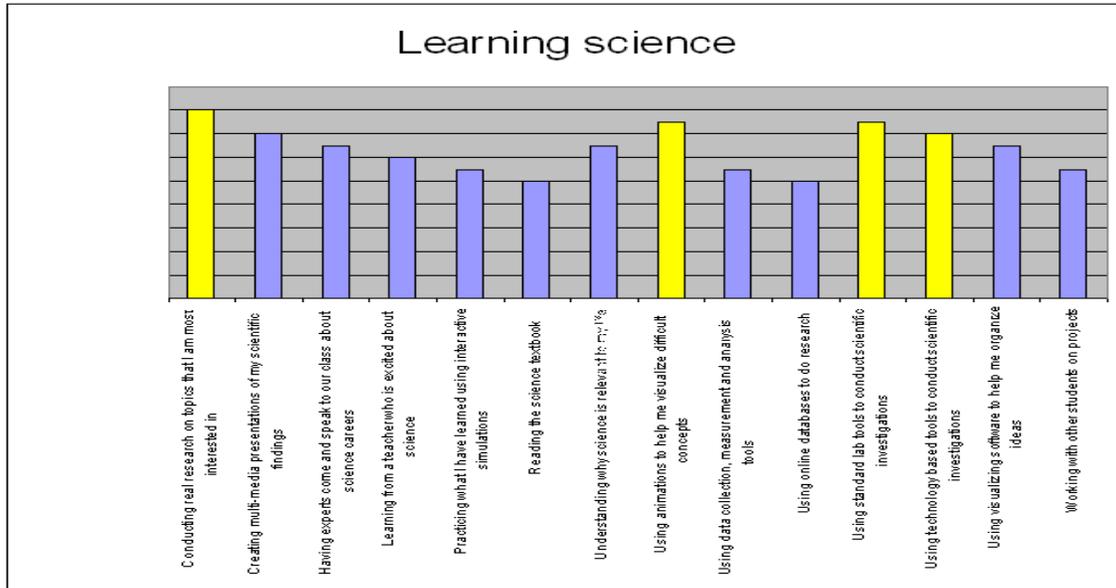


Figure 13. Students’ expressions for improved Science learning

#### 4.6. Teachers’ wish list

If all the obstacles are overcome then the teachers have different requirements for teaching aids in electronic devices. They felt that there is a need to support formative assessment, lesson plans, online tests, and summative assessments. Devices can also become like teachers’ book. It can also be used for upgrading teachers’ skills.

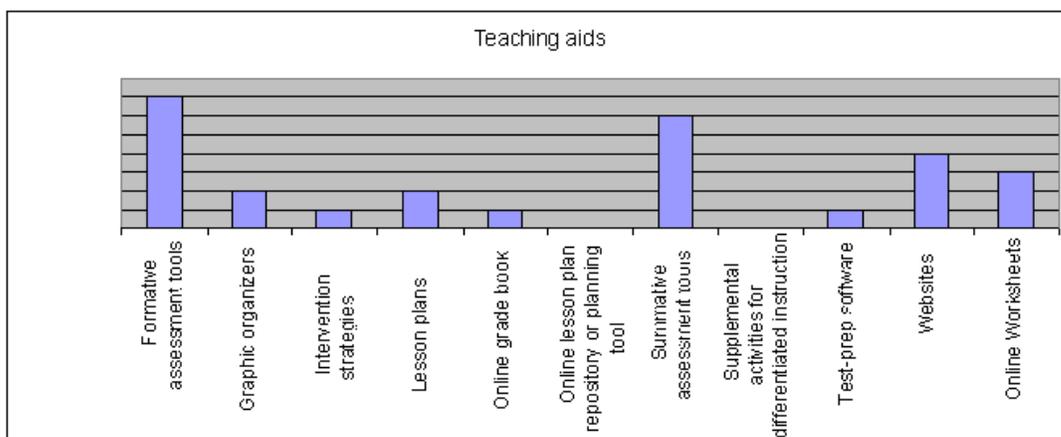


Figure 14. Teachers’ wish list of features in portable learning devices

Apart from the above, we also initiated a consulting project with the Global Executive MBA programme participants of Georgetown University to assess independently the status of the eReader market for schools in India. We present in the next section, some of the findings of the team in detail. The same

survey questionnaire used by us in our study for interviewing the students and teachers of select schools in Bangalore was used by the Georgetown team as well.

The main outcome of the above surveys and interactions with students and teachers are as follows:

**Table 2. Perception of eReaders in class rooms**

Students	Teachers/Administrators
 <ul style="list-style-type: none"> <li>▪ Computers, internet access, and mobile phones</li> <li>▪ E-mail (with students, teachers, parents)</li> <li>▪ Online access to grades and attendance records</li> <li>▪ Multimedia content, lessons, and learning games</li> <li>▪ Frequent users of Google, Wikipedia, social networking sites (Facebook, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Computers, internet access, and mobile phones</li> <li>▪ Online training modules and self-paced learning</li> <li>▪ Electronic Learning Management Systems (LMS) for grading, attendance, and internal staff mail</li> </ul>
 <ul style="list-style-type: none"> <li>▪ Application-based color interfaces</li> <li>▪ Note-taking, highlighting, bookmarking functionality</li> <li>▪ Stylus, touch, and type input capabilities</li> <li>▪ Access to internet, e-mail, and multimedia</li> <li>▪ Record and play-back lessons</li> <li>▪ Interactive multimedia and 3D course content</li> </ul>	<ul style="list-style-type: none"> <li>▪ Frequent and consistent upgrades to course content</li> <li>▪ Interactive multimedia and 3D course content</li> <li>▪ Require end-to-end support and initial training</li> <li>▪ Content tailored to school curriculum</li> <li>▪ Interlinked course materials and content</li> <li>▪ Access to LMS and e-mail</li> <li>▪ Affordability, longevity (multi-year use)</li> </ul>
 <ul style="list-style-type: none"> <li>▪ Potential for distractions in class (messaging, unrestricted internet and social media)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential for students to lose handwriting and drawing, grammar, and spelling skills</li> <li>▪ Potential distractions in class</li> <li>▪ Need to be able to control and direct content access</li> <li>▪ Fear that devices could be seen as a replacement for teachers</li> </ul>

 Current Tools    
  Desired eReader Features    
  eReader Concerns

#### 4.7. Current status of e-education ecosystem

In the survey it was observed that many of the features requested by students, teachers and school authorities are available as individual solution. One of the problems for slow adoption of technology solutions in to schools is due to the existence of multiple vendors offering piece meal solutions and the resultant co-ordination problems. From the interactions, we found that there is a need for a total solution provider. This includes providing devices, software and applications, connectivity and finally maintenance of the integrated solution. Following figure captures the different stakeholders and presents the role of an integrator that provides a one-stop solution to the needs of the schools.

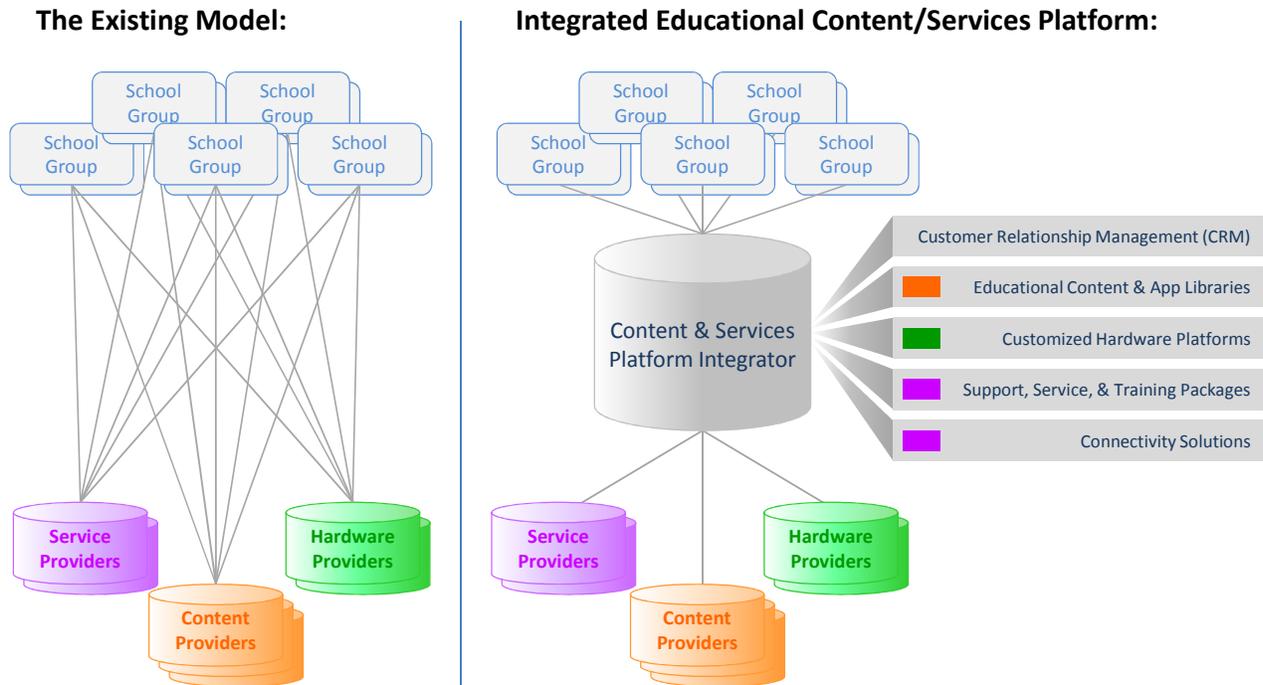


Figure 12. The ecosystem of stakeholders in e-education space

## 5. Sasken’s initiatives and idea generation

Based on the above requirements gathered through the survey, we initiated a contest for building some features to existing e-Book Readers available in the Android platform. The Request for Idea (RFI) is enclosed in Annexure III. The contest was floated to all the engineers of Sasken under the idea incubation programme called as “Quark”. About 19 entries were received. We had individual discussions with the ideators to refine the ideas so that prototypes could be built and exhibited. Finally the following *four* ideas were selected and the ideators were asked to present as well demonstrate their ideas regarding specific features appropriate for use in portable devices in school environment in a workshop held at Sasken premise on 7 February 2012.

Table 3. Ideas presented at Sasken conducted contest

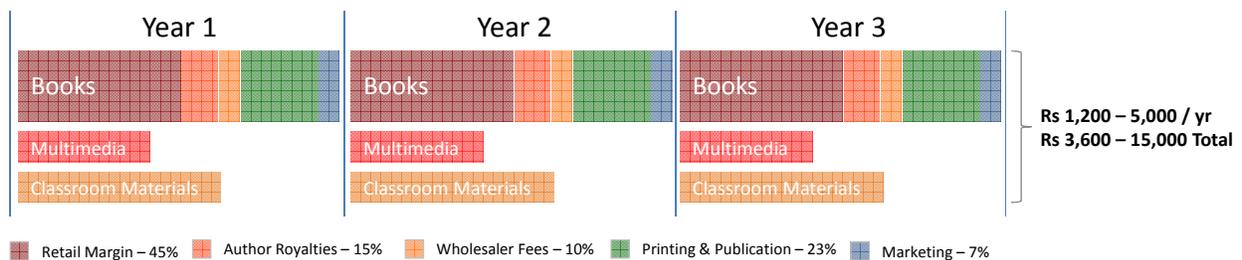
Idea	Brief
Idea 1: Instant assessor	This is the tool to assess the students instantly. Assessor can use this tool at the end of the class. Assessor can send questions to all students with a touch of a button. Instant report tells result of the students.
Idea 2: Teacher’s diary	An app for middle-school Teachers, providing several facilities for teachers to comfortably or effectively teach lessons in their class.

	Teachers can use this app to plan their sessions more effectively.
Idea 3: Time and syllabus tracker	Smart tool, which helps the teacher to generate the class time-table quickly and track the syllabus. School management, Students & Parents can view the time-table and syllabus and track progress.
Idea 4: Rapid Effective Assessment - based Learning (REAL)	This is a client-server kind of Android application. The application is used for objective assessment of trainee/student. The application has two parts: 1) examiner (course instructor) and 2) trainee (participant students). These application parts take the students through assessment and generate assessment data. Course instructors can make use of the application and data to speed up the participant's assessment. This helps make the education process interactive, objective, more effective and efficient. The application can be used in different types of education or learning environments or training institutes wherever objective assessment is involved.

Of the above, idea 3: Time and syllabus tracker was adjudged by a panel of juries as the winner of the context. The winning team comprising of 6 members and 3 ideators of the rest of the above idea set were facilitated with cash reward. The above set of prototypes gives an idea of how related applications can be developed for supporting the eLearning environment for schools.

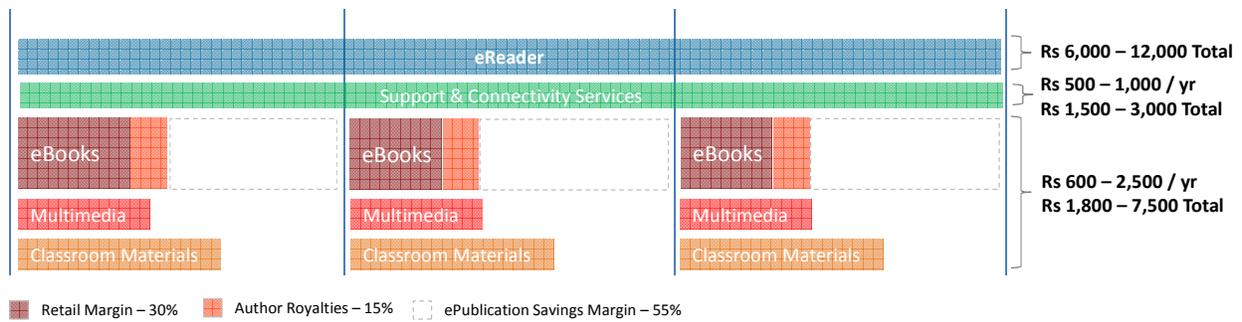
## 6. Strategy for entry in to eLearning market

The traditional value chain of the school books publishing market is given below.



**Figure 15. Value chain of traditional book and content distribution in schools**

The yearly outgo to the student is about Rs. 1,200-Rs. 5,000 depending on the extent of multimedia and other class room material provided to the students. However, as can be clearly seen, the retail margin contributes to roughly 45% of the price of the book followed by the printing and publication cost at 23%. Contrast this with the value chain of eBooks and the associated eReader devices as given below.

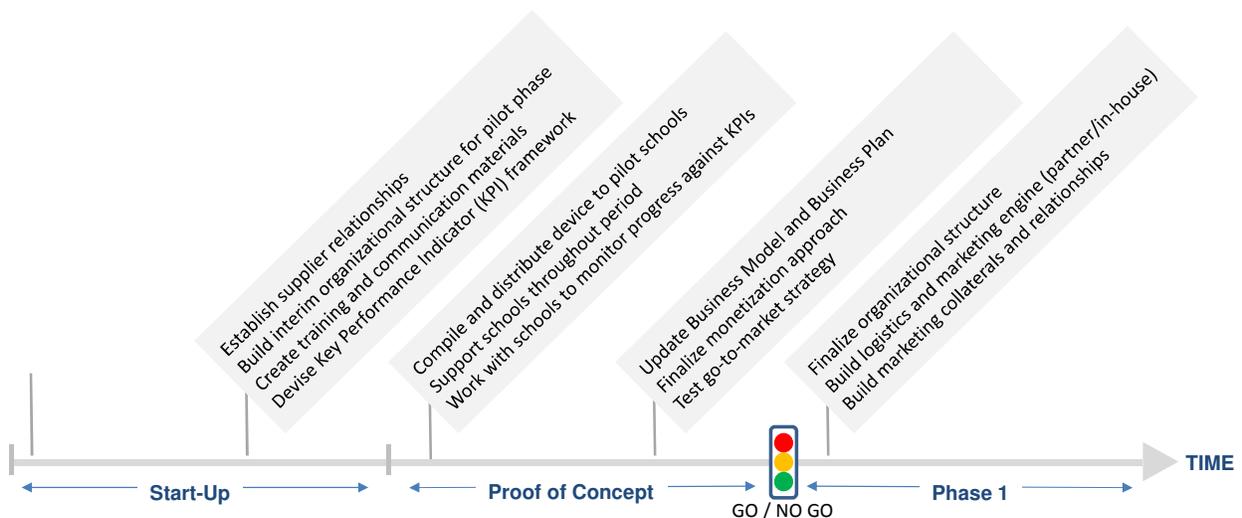


**Figure 16. Value chain of eBooks and content distribution in schools**

The retailer margin of eBooks, if sold through eRetailers is much lower at about 30%, which can also be reduced to around 10% if NCERT or any other publisher makes them available through their online stores. The wholesaler fees and printing costs do not exist. However these costs are replaced by the eReader device cost and connectivity cost. The total cost in this case is in the range of Rs. 8,300 - Rs. 22,500, which is about *three* times as expensive as the traditional model. The bulk of this cost is due to the eReader device. Hence despite the advantages provided by eBooks and eReaders, the option puts strain on the finances of parents of children. Hence it is imperative that the device cost is reduced as much as possible.

There are initiatives such as Aakash 2 and recently Aakash 4 that provide Tablets in the price range of Rs. 2,500 - Rs. 3,000, a bit higher than Rs. 2,263 of Aakash 2. The technical specifications of Aakash 4 as specified by the Indian Institute of Technology Madras recently and adopted by the Department of Electronics and Information Technology, Ministry of Communications & IT, Government of India are given in Annexure IV. Even with this low price, the price of eBooks based curriculum will be approximately twice as expensive compared to the traditional curriculum over 3 years (i.e. typical life span of the eReader device). Hence the target groups of schools should be mid or upper tier schools.

Given the above conditions of pricing and adoption rates, we propose the following Go-To-Market strategy for firms wanting to enter in to the area of system integration and solution provisioning for mid and upper level schools:



**Figure 17. Strategic steps for firms entering in to eBooks/ eReaders space**

Following are the capabilities required for firms to succeed in as a system integrator and solution provider for schools:

**Table 4. Capabilities required for service execution**

IT Services	Design and IP Utilization Device Support Customer Training
Relationships	Schools (Administrators, Teachers) Government Suppliers (Content, Hardware, & Service Providers) Telecommunications partners
Marketing	Sales and Relationship Management
Content Management	Negotiation, Procurement and complex 3 <sup>rd</sup> party management Asset Digitization
Technical Skills	Requirements and technical specifications
Supply Chain Management	Distribution Network and Logistics Management

### 6.1. Impact on Wireless Broadband Usage

To assess the impact on Wireless Broadband Usage, we estimate the bandwidth requirements of browsing through online material and downloading eBooks for a typical student and hence the school as follows:

**Table 5. Impact on broadband usage**

Amount of data capacity required for browsing eContent per day per student at the rate of about 20 MB per day	500 MB/Month
Amount of data capacity required per month for browsing eContent for a class of 30 students	1.5 GB/Month
Amount of data capacity required for 3 such classes in a grade	4.5 GB/Month
Amount of data capacity required for implementation of the same for classes VIII, IX and X in <b>one school</b>	<b>13.5 GB/Month</b>

The typical architecture for providing eLearning capabilities in schools is shown below in Figure 18. Each school typically has a landline based broadband connection. For schools in remote areas, 3G/4G access point is required. The access point is connected to School's WiFi network that provides connectivity within the campus. The access point in turn is connected to the public broadband network to provide high speed access. Since the landline based broadband connections (i.e. Digital Subscriber Line (DSL)) are scarce in India, the above architecture with 3G/4G connectivity is the plausible solution, thus driving up wireless broadband usage.

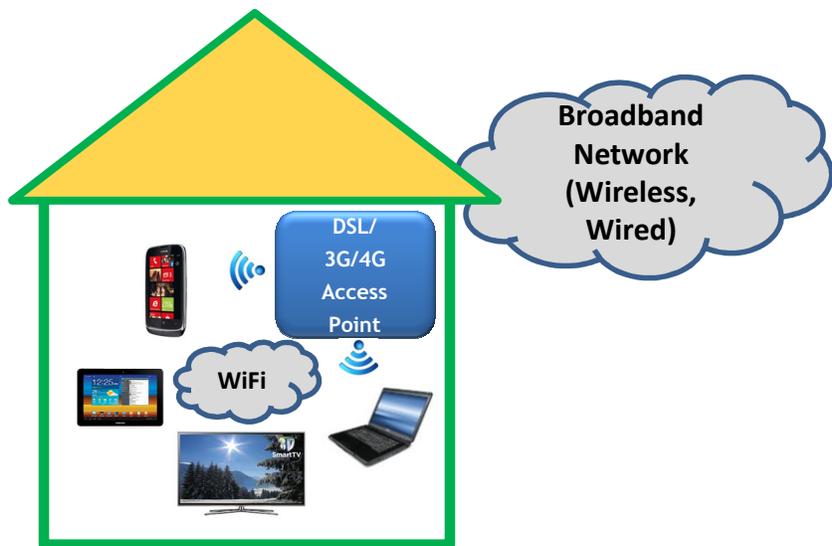


Figure 18. Network architecture for implementation of eLearning in schools

## 7. Conclusions

The project was carried with the objective of finding out the needs of students and teachers to incorporate eLearning in schools, including the use of eBooks and associated eBookReaders. We surveyed select chain of schools in Karnataka (Bangalore and Mysore) to assess the need. We did primary research on the eco system required for the development of comprehensive eLearning solutions for schools., The comparative financial analysis was carried out to determine the cost of traditional methods using hard copy books versus providing eBooks and eBookReaders. The analysis indicates that eBooks distribution across the value chain is expensive compared to the traditional method, though with certain definitive advantages. It is also pointed out that with the development of low cost Tablets it will become viable to use eBooks at least in medium and upper tier schools. Further, a contest was held to develop innovative eLearning applications on Android based Tablets that give us clues as to how we can enhance eLearning system in schools. Further a brief analysis is carried out to determine the impact of eLearning in schools on wireless broadband usage.

The results of the study can be used by the different stakeholders namely, schools, system developers and integrators and the Government to determine appropriateness of the implementation of eLearning in schools.

## 8. References

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## Annexure I: Students Survey

**1. What grade are you in? Please tick the box**

- Grade 3, Grade 4 or Grade 5
- Grade 6, Grade 7, Grade 8
- Grade 9, Grade 10, Grade 11, Grade 12
- Ungraded (please state your age)\_\_\_\_\_

**2. Gender**

- Girl/Female
- Boy/Male

**3. Thinking about the other students in your class, do you consider yourself...**

- An advanced tech user - more expert than most of the students at my school
- An average tech user - the same as most of the students at my school
- A beginner - below the skills of most of the students at my school

**4. What types of electronic devices do you have access to for your own use? (Check all that apply)**

- Cell (mobile) phone (without Internet access)
- Smartphone or cell (mobile) phone (with Internet access, such as: Blackberry, iPhone, Droid)
- Laptop computer
- Desktop computer
- Netbook or mini-notebook computer
- Tablet computer (such as iPad)
- Digital reader (such as: Kindle, Sony Digital Reader)
- Music or video device (such as: MP3 player, iPod or iPod Touch)
- Handheld digital video camcorder (such as: Flip Camera)
- Video Gaming System (such as: Xbox, Playstation, Wii)
- Handheld game (such as: GameBoy, Nintendo DS)
- Other

**5. What kind of computer or Internet access do you have outside of school? (select one)**

- A home computer with no Internet access
- A home computer with dialup or slow Internet access
- A home computer with fast Internet access (such as: DSL, Broadband, or cable)
- Outside of school, I only use computers at a location other than my home such as: the public library, after school program or community recreation center, etc.)
- My only access to computers or the Internet is at school

**6. How do you use technology for schoolwork? (Check all that apply)**

- Access class information (such as: grades, teacher's notes or presentations, podcasts)
- Communicate with other students (via email, IM, text or chat)

- Communicate with teachers (via email, IM, text or chat)
- Complete writing assignments
- Conduct research
- Conduct virtual experiments or simulations
- Create slide shows, videos or web pages for an assignment
- Get help from an online tutor
- Listen to a podcast for a class
- Participate in online communities
- Participate in videoconferences
- Participate in 3D virtual reality worlds (such as: Second Life, Whyville)
- Play educational games
- Post to blogs or wikis
- Take an online class
- Take tests online
- Upload assignments and homework to school portal
- Use my profile (MySpace, Facebook) to collaborate with classmates on a project
- Use online textbooks or other online curriculum
- Use Twitter to communicate or to follow others
- Work on projects with students in other countries
- None of the above

**7. In which of your classes is technology regularly used to enhance or increase your learning?**

- English/Language
- Maths
- Science
- Computer studies
- Other \_\_\_\_\_

**8. What are the major obstacles to using technology in your school? (check all that apply)**

- Cannot access the Internet
- Cannot access my personal email account or send email or IM to classmates
- Cannot use my own laptop in school
- Cannot use my own cell phone, smartphone or MP3 player
- I don't have the skills I need
- My assignments don't require using technology
- My school has different computers or software than I am used to
- Not enough computers or they don't often work
- Software is not good enough
- Teachers don't know how to use the technology
- Teachers limit our technology use
- The Internet is too slow
- There are rules against using technology at my school
- Websites that I need are blocked (through school filters or firewalls)

- There are no obstacles to using technology at my school
- Not a big deal. I rarely use the technology at my school
- Other \_\_\_\_\_

**9. How could your school make it easier to use technology for schoolwork? (Check all that apply)**

- Allow greater access to websites I need
- Let me access the school network from home or school
- Let me recharge my devices at school
- Let me use my own cell phone, smartphone or MP3 player
- Let me use my own laptop, or netbook (mini-notebook computer) during the school day
- Provide access to an online tutor
- Provide access to social networking sites (such as MySpace, Facebook)
- Provide class work, assignments and resources online
- Provide me a laptop or other mobile device that I can use at school
- Provide me with unlimited Internet or Wi-Fi access throughout the school
- Provide tools for me to organize my schoolwork
- Provide tools to help me collaborate with my classmates on schoolwork
- Provide tools for me to communicate with my classmates
- Provide tools for me to communicate with my teacher(s)
- Nothing - I like the way things are
- Other \_\_\_\_\_

**10. In some schools, students use mobile devices (cell phones, smartphones, MP3 players, etc.) to help with schoolwork. If that was allowed at your school, how would you use a mobile device to help you with your schoolwork? (check all that apply)**

- Access online textbooks
- Access social networking sites (such as: Facebook, MySpace)
- Access the school network from home or school
- Check grades
- Create or share documents, videos or podcasts
- Learn about school activities
- Look up information on the Internet
- Organize my schoolwork assignments
- Play educational games
- Record teachers' lectures so that I can refer to them later
- Send an email
- Share information with other students
- Take notes for class
- Take videos of class presentations or experiments to study from later.
- Text or IM someone to get help with schoolwork (such as teachers, students, parents or other family members)
- Upload or download information from my teachers' website and/or the school's portal
- Use language translator

- Use speech recognition software
- Use the calendar
- Use tools and applications to increase my productivity or organization
- Work on projects with my classmates
- None of the above
- Other \_\_\_\_\_

**11. In the past 12 months, how have you been involved in classes taught online? (check all that apply)**

- I researched taking an online class
- I took an online class for school that was led by a teacher
- I took an online class for school that was a self-study class
- I took a blended online class where I spent part of the time online and part of the time in a classroom
- I took an online class for personal reasons (outside of school)
- I have not taken an online class but I am interested
- I am not interested in taking a online class

**12. If you have taken an online class, you can skip this question. If you have not taken an online class, why not? (check all that apply)**

- I have not found a class I am interested in
- My school does not offer online classes
- I do not know about the online classes offered at my school
- I do not know how to find information about online classes outside of my school
- No one at my school can help me find online classes to meet my needs
- I do not know how to sign up for an online class
- I cannot afford to pay for an online class
- I am not sure this would be a good way to learn
- I am not interested in taking an online class
- I have taken an online class

**13. Imagine that you can design a new kind of textbook that will be 100% online. What should be included in that new online textbook? (check all that apply)**

- Ability to create podcasts or videos
- Ability to download information to my cell phone
- Ability to make electronic highlights or notes
- Ability to print from the online textbook
- Ability to search through the textbook by key terms or events
- Access to 3D content
- Animations and simulations that explain concepts
- Brain teasers or advanced topics to extend my learning
- Calculator

- Chat room with video capability
- Dictionary
- Email tools
- Games to explore concepts or ideas I am learning
- Information about careers that use the academic subject of the textbook
- Links to real-time data (such as: population, weather, NASA, earthquakes, Google Earth, etc)
- Links to useful websites
- Mobile applications
- Online tutors
- Podcasts from subject experts
- Podcasts from my teacher about the subject matter
- PowerPoint presentations of lectures
- Problems and experiments to conduct virtually or in real life
- Quizzes and tests that I can take myself
- Self-paced tutorials
- Take an online class
- Tools to help me collaborate or share information with my classmates (such as: blogs, social networking sites, wikis, bookmarking)
- Tools to help me develop my writing skills
- Tools to help me organize my schoolwork (communications, organize my assignments, take notes)
- Tools that show me where I need to improve
- Video clips about topics I'm studying
- Virtual labs
- Virtual notebook
- Virtual reader that could read the text aloud
- Webcams or video conferencing capabilities
- I don't think online textbooks are a good idea for me
- Other \_\_\_\_\_

**14. What would make learning science more interesting, engaging and relevant for you? (check all that apply)**

- Conducting real research on topics that I am most interested in
- Creating multi-media presentations of my scientific findings
- Having experts come and speak to our class about science careers
- Learning from a teacher who is excited about science
- Practicing what I have learned using interactive simulations
- Reading the science textbook
- Understanding why science is relevant to my life
- Using animations to help me visualize difficult concepts
- Using data collection, measurement and analysis tools
- Using online databases to do research
- Using standard lab tools to conduct scientific investigations

- Using technology based tools to conduct scientific investigations
- Using visualizing software to help me organize ideas
- Working with other students on projects
- Other \_\_\_\_\_

**15. Which of these Internet based tools or applications do you use outside of school? (check all that apply)**

- Communicate with others through email, IM or text message
- Communicate with others through discussion boards, social networking sites, chat or online communities
- Contribute to a wiki (such as: Wikipedia)
- Create new work using pre-existing text, graphics, audio, video or animation (MashUp)
- Participate in 3D virtual reality worlds (such as: Second Life, Whyville)
- Participate in online games
- Update my profile (such as: MySpace, Facebook)
- Upload or download videos, podcasts or photos to/from the Internet
- Use web tools to create a list of resources I want to share or remember (such as: del.icio.us, digg, diigo, reddit)
- Use web tools for writing collaboratively with others (such as: GOOGLE docs, writeboard or letterpop)
- Use web tools to create or modify videos, music, audio or animation
- Use web tools (such as: GOOGLE reader) to notify me about things I'm interested in (such as news or magazine articles, or changes to websites)
- Write or contribute to a blog (my own or someone else's)
- None of the above

**16. If you had to write about a topic that you knew little about, what would you do first? (Select One)**

- Ask a friend for help
- Ask a family member for help
- Ask a tutor or after school club leader for help
- Ask my teacher for help
- Ask the librarian for help
- Enter my research topic in a search engine (e.g. Google, Bing, Yahoo etc)
- Find a book in the library
- Go to a website with original source material (e.g. Library of Congress, museums)
- Go to Wikipedia to find basic information
- Look in my textbooks for information
- Post a question on my social networking site (e.g. MySpace, Facebook) about the topic
- Search online databases or resource portals provided by my school
- Use Twitter to post a message asking for help

- Visit a social bookmarking site
- Visit a website recognized for its expertise in the topic (such as: NASA, National Geographic Society)
- Visit media sites (such as: newspapers, magazines, television)
- Other \_\_\_\_\_

**17. In the past year, which of these things have you done on your own (not teacher directed, not homework) to improve your education? (check all that apply)**

- Found a tutor online
- Found a website that helped me better understand a topic we were studying in class
- Found experts online who could answer my questions
- Found information on the Internet
- Listened to podcasts or watched videos about a topic I was interested in
- Posted to a blog
- Sought help from other students through my social networking site
- Started a wiki or blog to share my ideas and connect with others
- Took a self-paced tutorial on a subject
- Took an online class
- Took an online test or assessment
- Took part in an online game or simulation
- Tutored other students who needed help
- Used cell (mobile) phone applications to help with my self-organization
- Used online writing tools to improve my own writing
- Used Twitter to send a tweet about something I was studying
- Wrote and submitted stories or original writings to an online site
- None
- Other \_\_\_\_\_

**18. Which of these have been problems for kids at your school? (Choose any that apply)**

- Approached by strangers online
- Being harassed online with hurtful texts or photos
- Seeing websites with inappropriate content
- Sharing too much personal information online
- Spending too much time online
- Students using others' ideas as their own (plagiarism)
- Sharing suggestive texts or photos
- Strangers asking to meet in person
- Students' mobile devices have been stolen
- Students using mobile devices to cheat
- None of the above
- Other \_\_\_\_\_

**19. Imagine you are designing the ultimate school. Which of these tools would have the greatest positive impact on your learning? (check all that apply)**

- Ability to access the Internet anywhere at school
- Ability to use my own mobile devices
- Chat rooms to discuss topics with students while in class
- Collaboration tools (such as: blogs, social networking sites, wikis, bookmarking)
- Computer projection devices
- Digital media tools (video, audio)
- Digital reader (such as: Kindle, Sony Digital Reader)
- Digital content (such as: databases, electronic books, animations, videos etc)
- Document camera (such as: ELMO)
- Electronic portfolios for students
- Email tools
- Handheld digital video camcorder (Flip Camera)
- Games or virtual simulations
- Handheld student response systems
- Instant messaging or text messaging tools
- Interactive whiteboards (such as: Smartboard, Polyvision)
- Learning management systems (such as: Blackboard, Moodle, Angel)
- Mobile computer for every student (such as: laptop, mini-notebook)
- Mobile devices (such as: cell phones, MP3 players, iPods)
- Online classes
- Online textbooks
- Online tutors
- School website or portal
- Simulations
- Software customized to my learning needs
- Tablet PC (such as iPad)
- Tools to help me organize my work (such as: organize my assignments, take notes, organize my ideas)
- Video conferences and webinars
- Virtual or online whiteboard
- Virtual reality games or environments
- Webcam
- Wireless microphone system for the teacher
- Other \_\_\_\_\_

**20. How much do you agree with this statement: My school is doing a good job of using technology to enhance my learning. (select one)**

- Strongly agree
- Agree
- Disagree
- Strongly disagree

## Annexure II: Teachers' survey

1. **What grade(s) do you currently teach?**
  - Grade 3, Grade 4 or Grade 5
  - Grade 6, Grade 7, Grade 8
  - Grade 9, Grade 10, Grade 11, Grade 12
  - Ungraded (please state your age)\_\_\_\_\_
  
2. **What subject(s) do you currently teach primarily? (Select one)**
  - General Elementary (all subjects)
  - Humanities
  - Computer Sciences
  - Maths
  - Science
  
3. **Thinking about your peers, do you consider yourself...**
  - An advanced tech user - more expert than most of my peers
  - An average tech user - about the same as my peers
  - A beginning tech user - less developed than my peers
  
4. **What types of electronic devices do you have access to for your own use? (check all that apply)**
  - Cell phone (without Internet access)
  - Smartphone or cell phone (with Internet access such as: Blackberry, Droid or iPhone)
  - Desktop computer
  - Laptop computer
  - Netbook or mini-notebook computer
  - Tablet PC (such as iPad)
  - Digital reader (such as: Kindle, Sony Digital Reader)
  - Music or video device (such as: MP3 player, iPod, or iPod Touch)
  - Handheld digital video camcorder (such as: Flip Camera)
  - Video Gaming System (xBox, Playstation, Wii)
  - Handheld game (such as: GameBoy, Nintendo DS)
  - Other \_\_\_\_\_
  
5. **Which of these activities do you regularly do for professional tasks? (check all that apply)**
  - Communicate with peers or parents using email, IM or text messaging
  - Communicate with students using email, IM or text messaging
  - Conduct Internet research
  - Create and upload videos, music or pictures
  - Create multi-media presentations
  - Listen to a podcast, watch videos or view presentations
  - Manage electronic portfolios for students

- Participate in professional online communities
- Participate in video conferences or webinars
- Read or post blog or wiki entries
- Read text-based resources (such as: electronic textbooks, newspapers, magazines, digital archives)
- Take an online class
- Update my profile (MySpace, Facebook, LinkedIn)
- Upload class information (such as: grades, homework assignments, teachers notes or presentations, podcasts, turn in assignments)
- Use desktop widgets
- Use Twitter to communicate or to follow others
- None of the above
- Other
- Share information with other teachers or administrators via district portal
- If Other is selected, please specify:

**6. How do you use technology to facilitate student learning? (check all that apply)**

- Conduct investigations
- Create cues, questions or advanced organizers
- Create graphic organizers for comparing, classifying, creating metaphors and analogies
- Create physical models or use pictures to represent knowledge
- Facilitate group collaboration and structure
- Homework and practice
- Note taking and synthesis of information
- Provide feedback to students
- Set student objectives
- Share exemplary student work in classroom, school or with parents
- Students create movies or animation projects
- Track the relationship between effort and achievement
- None of the above

**7. Today students have access to mobile devices that are small, light enough to carry in one hand and provide a high degree of multi-functionality. Teachers and students are exploring how to use these devices for learning. What do you think would be the primary benefits of incorporating such devices into instruction? (check all that apply)**

- Access to online textbooks
- Helps teachers improve their technology skills
- Improves teacher-parent-student communications
- Increases student engagement in school and learning
- Increases teacher productivity
- Provides a way for instruction to be personalized for each student
- Provides a way for me to create a learning centered environment
- Provides a way for students to informally review classroom material

- Provides opportunities for informal remediation
- Students develop collaboration and teamwork skills
- Students develop critical thinking and problem solving skills
- Students develop stronger communications skills
- These devices help to extend learning beyond the school day
- I don't think these devices will positively impact learning
- No significant benefit
- Other \_\_\_\_\_

**8. What is your biggest concern about students using mobile devices in your classroom? (check all that apply)**

- Finding age appropriate resources for my students
- I am concerned students will cheat on tests
- I am concerned that students will be distracted doing other things (such as: surfing the Internet, texting, playing games)
- I don't have curriculum to support their use
- I don't know how to effectively integrate mobile devices into my instruction
- I don't know which features I could use for instruction
- I don't see the value of using mobile devices within instruction
- Not appropriate for the ages of my students
- Not all of my students have mobile devices
- Parents will not support the use of mobile devices
- Teaching my students how to use mobile devices responsibly
- I will lose control of the class
- Students don't use mobile devices in my classroom
- Other \_\_\_\_\_

**9. How would you describe your interest in using a learning management system or teaching an online class?**

- I have researched using a learning management system in my class
- I am using a learning management system in my class
- I don't know what a learning management system is
- I am not interested in using a learning management system in my class
- I researched teaching an online class
- I have taught a class that is 100% online
- I have taught a blended class that includes online and face-to-face components
- I have not taught an online class but I am interested
- I am not interested in teaching an online class

**10. Student demand for online courses is increasing; however, currently there are not enough teachers willing to teach these classes. Which of the following would motivate you to teach an online course? (check all that apply)**

- Ability to work with more motivated students
- Co-teaching an online course with another teacher

- Flexibility with my working conditions
- Having first-hand experience by taking an online course
- Increased compensation
- Increased prestige and professional recognition
- Knowing that my current credentials are sufficient to teach online
- Knowing about job opportunities for teaching online courses
- Learning a new set of professional skills
- Letting me create my own course
- Providing me with the necessary technology to facilitate the course
- Providing the curriculum to teach the course
- Selecting my preferred teaching assignments
- Talking to teachers who are successful teaching online courses
- Teaching at-risk students
- Teaching gifted students
- Understanding what's needed to teach effectively in an online environment
- Wanting to develop a more personalized approach to my teaching practice
- Working with other innovative teachers
- I don't think I can be motivated to teach an online course
- Other \_\_\_\_\_

**11. What is your preferred method for professional development? (pick top 3)**

- Conference workshops or sessions (sponsored by professional associations)
- I like to learn on my own at the time I need it
- In-school mentoring program
- Online courses
- Participating in a professional learning community
- Peer-to-peer or school study teams
- Podcasts or webcasts
- School or district provided trainings
- Summer Institutes (sponsored by my local university/college, museums, professional associations etc)
- University or college course
- Workshops from the County Office of Education or educational services offices
- Workshops provided by textbook publishers, vendors or technology providers
- None of the above
- Other \_\_\_\_\_

**12. What has been your experience with online professional development? (check all that apply)**

- I have participated in a 100% online course
- I have researched taking an online professional development class or workshop
- I have participated in a 100% online professional development class or workshop
- I have taken a blended online professional development class that included online and face-to-face time

- I would like my school district to offer more online professional development opportunities
- I am not interested in participating in professional development online
- Other \_\_\_\_\_

**13. How would you like your district to use technology to create a professional learning community? (Pick your top 3 options)**

- Partner with universities to provide graduate level courses
- Provide online courses
- Provide tools that enable me to collaborate with teachers at my school
- Provide tools that enable me to collaborate with other teachers outside of my school
- Provide a centralized repository of teaching resources
- Provide easy access to student data that I can use to inform my teaching
- Use blogs or wikis to share 'best-practice'
- Use digital readers (such as Kindle) to share books on best practices
- Use podcasts or webcasts to share teaching topics
- Use webinars and video conferencing to connect me with experts in my field
- Other
- Share documents and note taking for collaborative professional work
- If Other \_\_\_\_\_

**14. What types of digital content are you currently using in your classroom?**

- 3D content
- Animations
- Electronic book subscriptions
- Game-based environments
- Online curriculum
- Online databases (such as census data, education statistics)
- Online periodical, news or journal subscriptions
- Online subscription service of digital resources
- Online supplemental materials
- Online textbooks
- Podcasts or Video (such as: iTunes, YouTube, TeacherTube, SchoolTube etc.)
- Real-time data (such as: population, weather, NASA, GOOGLE Earth, GIS etc)
- Simulations
- Software to help students develop skills (reading, writing, math, foreign language)
- Software to help students develop higher-order thinking skills
- Teaching aids
- Tutorials
- Virtual field trips
- Virtual labs
- None of the above
- Other \_\_\_\_\_

**15. Specific to the category of teaching aids that you find online, which of these are you using in your classroom? (check all that apply)**

- Formative assessment tools
- Graphic organizers
- Intervention strategies
- Lesson plans
- Online grade book
- Online lesson plan repository or planning tool
- Summative assessment tools
- Supplemental activities for differentiated instruction
- Test-prep software
- Websites
- Online Worksheets
- Other \_\_\_\_\_

**16. Which of these factors would you consider most important when evaluating the quality of digital content to use in your classroom? (check all that apply)**

- Certified by education membership associations and organizations
- Compiled on a list by our State Department of Education or Ministry of Education
- Content is fee-based
- Content is free
- It is an "Open Education Resource"
- Learn about it on a webinar or virtual conference
- Materials are created by practicing teachers
- Recommended on education blogs and websites
- Referred by a colleague
- Learned about the resource through a demonstration at a conference
- Source is an online curriculum company or organization
- Source is an established media or content producer (such as: NBC, Discovery, PBS)
- Source is a content expert organization (such as: National Science Foundation, universities)
- Student achievement with the materials
- Teacher evaluation of the materials
- Textbook publisher recommendations
- Other \_\_\_\_\_

**17. On any given school day which of these examples describes how you are using technology in your classroom. (check all that apply)**

- Assessing student understanding through handheld student response systems, electronic portfolios or multi-media projects
- Connecting students to learning opportunities outside of the classroom through webcams, videoconferencing, or webinars
- Creating a digitally-rich learning environment using games, virtual simulations, or digital content (such as databases, electronic books, animations, or videos)

- Creating opportunities to extend learning beyond the school day through mobile devices
- Empowering collaboration between students using blogs, social networking sites, wikis, or GOOGLE docs
- Facilitating lessons through the use of interactive whiteboards, digital projectors or document cameras (such as an ELMO)
- Letting students IM or text message to help each other with schoolwork
- Managing my class through a school portal, learning management system (such as Blackboard, Moodle or Angel) or teaching an online class
- Providing feedback to students on performance through school portals or communication tools
- Providing opportunities for students to create content and represent their knowledge using multi-media tools
- Using interactive whiteboards to facilitate student collaboration or content creation
- None of the above
- Other \_\_\_\_\_

**18. In addition to knowing core content subjects, which of these information and media literacy skills are most important for your students in order to be successful in the 21st century? (check all that apply)**

- Ability to conduct research
- Ability to identify information sources and how to locate resources
- Ability to evaluate the relevance, authenticity, and credibility of resources
- Ability to organize information
- Know how to prepare written or verbal reports of research
- Know how to produce blogs, vlogs, podcats, digital storytelling or video
- Know how to analyze and interpret stories, commercials, or ads in the media (TV, magazines, newspapers, blogs etc)
- Know how to detect bias, censorship or propaganda in resources
- Students have the ability to evaluate their own work to improve their effectiveness
- Know how to summarize research
- Know how to use technology and digital content responsibly
- None of the above
- Other \_\_\_\_\_

**19. Which of these have been problems for students at your school? (check all that apply)**

- Approached by strangers online
- Personal information shared with others online
- Seeing websites with inappropriate content
- Students using others' ideas as their own (plagiarism)
- Being harassed online with hurtful texts or photos
- Sharing suggestive texts or photos
- Spending too much time online
- Strangers asking to meet in person
- Students' mobile devices have been stolen

- Students using mobile devices to cheat in class
- None of the above
- Other \_\_\_\_\_

**20. How has your use of technology within instruction enhanced your students' academic success?**

- More students are participating in discussions or group activities.
- Students are applying their knowledge to practical problems.
- Students are creating models and testing their assumptions
- Students are demonstrating higher levels of proficiency on standardized tests.
- Students are developing their problem-solving and critical thinking skills
- Students are developing their creativity
- Students are gaining a better understanding of the class material through "trial and error"
- Students are more deeply exploring their ideas
- Students are more motivated to learn
- Students are spending more time on drill and practice
- Students are taking ownership for their learning
- Students are working together more often
- Students have a better understanding of abstract concepts
- Students learn that failure is an opportunity to learn.
- I don't know
- Other \_\_\_\_\_

**21. How has the use of technology improved your effectiveness as a teacher?**

- I am better organized
- I am facilitating student centered learning
- I am more productive
- I encourage students to be more self-directed
- I facilitate collaboration between students
- I give my students more personalized attention
- I have time to differentiate instruction
- I know when students are having problems with the content
- I am creating more relevant lessons
- I spend more time with individual students to help them understand the content
- I am more connected to my students.
- I am managing my class more effectively.
- It's easier to assess how my students are doing
- I am creating more interactive lessons.
- I have a better understanding of what my students are learning
- None of the above
- Other \_\_\_\_\_

**22. Imagine you are designing the ultimate school for 21st century learners. Which of these tools or strategies do you think holds the greatest potential for increasing student achievement and success? (check all that apply)**

- Ability for students to use their own mobile devices
- Ability to access the Internet anywhere at school and in my classroom
- Adaptive learning software which adjusts levels of difficulty and content to address student needs
- Chat rooms to discuss topics with students while in class
- Collaboration tools (such as: blogs, social networking sites, wikis, bookmarking)
- Computer projection devices
- Digital media tools (such as: video, audio)
- Digital reader (such as: Kindle, Sony Digital Reader)
- Digital content (such as: databases, electronic books, animations, videos etc)
- Document camera (such as: ELMO)
- Electronic portfolios for students
- Email tools
- Games or virtual simulations
- Handheld digital video camcorder (Flip Camera)
- Handheld student response systems
- Instant messaging and text messaging
- Interactive whiteboards (such as: Smartboard, Polyvision)
- Learning management systems (such as: Blackboard, Moodle, Angel)
- Mobile computer for every student (such as: laptop, mini-notebook)
- Mobile devices (such as: cell phones, smartphones, MP3 players)
- Online classes
- Online textbooks
- Online tutors
- School portal or website
- Simulations
- Tablet PC (such as iPad)
- Tools that help students organize their work (such as: communication, organize my assignments, take notes, organize my ideas)
- Video conferences and webinars
- Virtual or online whiteboard
- Virtual reality games or environments
- Webcam
- Wireless microphone system for the teacher
- Other \_\_\_\_\_

**23. With so many new technology tools coming into your classroom, what do you need in terms of professional development to be more effective? What is your training wish list?**

**24. Highest level of educational attainment**

- Some College
- Bachelor's degree
- Teaching Certificate
- Masters degree
- Doctorate
- Other \_\_\_\_\_

**25. At the end of this school year, how many years of teaching experience will you have?**

- 1-3
- 4-10
- 11-15
- 16+

## Annexure III: Request for Ideas

### 1.Objective

Identify and develop ideas for e-learning applications to be used in Tablet PC in schools.

### 2.What is required from the Ideator

- i) Ideas and inventions on applications and services that are not yet there; but could potentially have a market that is focused on Indian schools catering to 8 -10 standards. Ideas are expected to address student's and or teacher's needs.
- ii) The uniqueness of the idea and its implementability.
- iii) Application demonstration on tablet PC. Please note that this is an important requirement. A subset of the features needs to be demonstrated on an Android Tablet PC.

From preliminary investigations, we have observed that the following features are required especially integrated with the e-Book Reader:

- i) Highlighting of portions of the text.
- ii) Scribe tool for taking notes at the margins of the e-Book
- iii) Making important notes for future reading / examination / revision
- iv) Embedded video and animation support to show for example, a geographical area and culture (Geography subject), scientific experiments (in Science subject) to illustrate better the concepts.
- v) Dictionary / Language translator for given words
- vi) A good assessment tool that the student can take before proceeding to next page/ chapter.
- vii) Class diary / lesson tracker/ lesson sync
- viii) A policy tool for allowing access to specific content (e.g. Geography, Maths) during only certain times of the days (e.g. second, fourth periods) / school message broadcaster.

The ideators are encouraged to use the standard template available at Quark site for documenting the idea. Develop couple of features of the applications to demonstrate on any tablet PC.

Following are the deliverables:

- i) Develop idea on android platform
- ii) Demonstrate on any Android tablet PC either high end (Samsung / Dell ..) or low end china make.
- iii) The Quark team also can provide you with an Android Tablet for testing some of your applications and for the demo.

### 3.Clarifications:

- Some of the features like Highlighting, Scribe, Making important notes, Dictionary, Language translator may already available on Kindle app but we are looking for feature integrated in a generic epub format content readable in a generic e-BookReader
- While the demo may be done in a high-end Android tablet, we are really targeting to port this application on sub 10,000 retail (sub Rs. 6,000 at whole sale) price tablet (similar to one you see in BMTC buses) - of course Chinese ones and hence our capability to understand and demonstrate on Android so that it can be ported on to a low cost device later.
- The joint study of school chains such as DPS, NPS, Ryan, KV, with Georgetown MBA students; the stats have shown that teachers and students have shown keen interest in adopting tablets even though their adoption rate in India is low.

- Tablet PC are focused on 8 - 10 classes to lower the breakage rate and to add customizable content in addition to CBSE/ICSE content; just at right age for e-BookReader; younger -> no matured; older -> possible

## Annexure IV: Technical Specifications of Aakash 4

Source:

[http://deity.gov.in/sites/upload\\_files/dit/files/Proposed%20Aakash%20IV%20Technical%20Specifications\\_0.pdf](http://deity.gov.in/sites/upload_files/dit/files/Proposed%20Aakash%20IV%20Technical%20Specifications_0.pdf)

Sl No		
<b>1</b>	<b>Minimum Hardware Requirements</b>	
1.1	Processor Performance Specification should be as per <b>Appendix-A</b> with the latest benchmark apps (with the desired minimum/maximum scores)	
1.2	Hardware accelerator for playing true HD720p with at least 30fps	
1.3	Hardware accelerator should be capable of supporting OpenGL ES 2.0. Hardware accelerator performance should be as per specification given in <b>Appendix-A</b> with the latest benchmark apps (with the desired minimum/maximum scores)	
1.4	<b>Memory (RAM):</b> 1 GB DDR3 SDRAM 1066 MT/S or better	
1.5	<b>Storage (Internal):</b> 4 GB or more integrated flash	
1.6	<b>Storage (External):</b> Micro SD Card 2.0 (SD High Capacity) Interface (up to 32GB supported). SD Card interface should be compatible with NFC based SD card.	
1.7	<b>Peripherals:</b> One non-powered USB OTG Micro-AB Receptacle (USB 2.0 Compliant) and one powered USB Type A Standard Receptacle (USB 2.0 Compliant). USB OTG Micro-AB Receptacle can be used to connect external powered USB host or external non-powered devices through external powered USB Hub. USB Type A Standard Receptacle will be used to connect external non-powered USB device. USB ports should be reliable and of high quality. USB port manufacturer's name and its quality certification should be provided.	
	1.7.1	USB Type A Standard Receptacle based port will be able to source maximum of 500mA current to attached devices
	1.7.2	Support for the following external devices 1. USB Storage Device

		<ol style="list-style-type: none"> <li>2. Keyboard</li> <li>3. Mouse</li> <li>4. USB Hub</li> <li>5. All popular 2G/3G/4G Phone / Data Connectivity Dongles in India</li> <li>6. USB to Ethernet adaptors</li> <li>7. USB Printers</li> </ol>
1.8	USB and SD card should be detected and be able to work simultaneously. Should support file browsing facility	
1.9	USB should be able to support USB mouse and USB keyboard simultaneously through external USB Hub	
1.10	<b>Combined Audio-in and Audio-out:</b> 3.5 mm jack (Order: Tip, Ring, Microphone, Ground) for connecting stereo headphones and integrated speaker(s) as well as for external microphone and integrated microphone. Speaker section capable of generating at least sound of 85 dB +/- 3dB in the frequency range of 20 Hz and 20000 Hz. Microphone section capable of receiving minimum sound of -45 dB +/-4dB in the frequency range of 300 Hz to 3400 Hz	
1.11	<b>Display and Resolution:</b> 7" LCD display with at least 800x480 resolutions with 16 bit or higher colour depth. LCD brightness should be a minimum of 290 cd/m <sup>2</sup> , and its contrast ratio should be a minimum of 500.	
1.12	<b>Input Devices:</b> 7" multi-point projective capacitive touch with a minimum capability of five simultaneous touches	
1.13	<b>Connectivity and Networking</b>	
	1.13.1	<b>WiFi IEEE 802.11 b/g/n</b> <ol style="list-style-type: none"> <li>1. Portable Wi-Fi Hotspot functionality</li> <li>2. Maximum transmit power &gt;= 15 dBm</li> <li>3. Minimum receive sensitivity &lt;= -83 dBm</li> <li>4. Maximum TCP data rate &gt;= 25 Mbps (for both upload and download)</li> <li>5. Performance base line: Sustaining throughput &gt;= 1 Mbps for 2 hours of line of sight distance between tablet and Access Point being 30 m</li> <li>6. Certification is to be obtained from WiFi Alliance</li> </ol>
	1.13.2	<b>Bluetooth (Version 2.1 Class 2 or better) IEEE 802.15.1</b> <ol style="list-style-type: none"> <li>1. Certification is to be obtained as per Bluetooth SIG</li> <li>2. All Bluetooth Profiles supported by the Android should be enabled</li> </ol>
<b>1.14</b>	<b>Power and Battery</b>	
	1.14.1	<b>Battery</b> <ol style="list-style-type: none"> <li>1. <b>Battery Capacity:</b> Minimum 3 Hrs for online 720p video playback (LCD with a brightness of 290 cd/m<sup>2</sup>, Audio speaker at a volume of 85 dB, WiFi ON with a receive signal strength between -65 dBm and -70 dBm), Minimum 4 Hrs for offline video playback (LCD with a brightness of 250 cd/m<sup>2</sup>, Audio speaker at a volume of 60 dB, WiFi OFF), Minimum 5 Hrs on web browsing (LCD with a brightness of 250 cd/m<sup>2</sup>, Audio speaker at a volume of 60 dB, WiFi ON with a receive signal strength between -65 dBm and -70 dBm), 6 Hrs on e-reader (LCD with a brightness of 250 cd/m<sup>2</sup>, Audio speaker at a volume of 60 dB, WiFi OFF)</li> <li>2. <b>Battery Charging:</b> Should be able to charge from AC from 10% to 80% of battery capacity within 2 hours from external power adapter <u>when the tablet is switched OFF</u>, support charging from USB port, support charging from DC power port with receptacle compliant to EIA-J-02 (standardizing on power connector). Two colour LED indication for charging and full charge.</li> </ol>

			<p>3. <b>Battery life</b></p> <p>a. At 25 degree centigrade, battery should have a life of 600 cycles or 2 years (whichever is earlier) <u>with a minimum left over battery capacity of 50%.</u></p> <p>b. Capacity to be <math>\geq 80\%</math> at the end of 300 charge cycles, <u>Capacity to be <math>\geq 50\%</math> at the end of 600 cycles</u> (One cycle consists of standard charging, resting for half an hour, discharging with LCD with a brightness of 290 cd/m<sup>2</sup>, Audio speaker at a volume of 85 dB, WiFi ON with a receive signal strength between -65 dBm and -70 dBm until the tablet is turned OFF).</p> <p>4. <b>Self discharge:</b> Battery charge should be <math>\geq 90\%</math> even after 30 days (when the tablet is turned OFF)</p> <p>5. <b>Safety:</b> Should comply with IEC 62133 : 2002</p> <p>6. <b>Battery Warranty:</b> 1 year</p> <p>7. <b>Battery Datasheet:</b> Manufacturer of the Aakash tablet is to provide battery data sheet provided by manufacturer of battery.</p> <p>8. Short circuit and over charge protection capability.</p>
	1.14.2	<b>Battery Charger</b>	
			<ol style="list-style-type: none"> <li>AC input plug: 2-pin Plug (Compliant to Indian Standard)</li> <li>Input voltage range: 100-270V AC</li> <li>AC frequency: 50/60 Hz</li> <li>Cable length: <math>\geq 1</math> m</li> <li>DC output plug: Compliant to EIA J-02</li> <li>Nominal DC output voltage: 5V</li> <li>Safety and compliance: IS13252, EN 301 489-34</li> </ol>
	1.15	<b>3-Axis Accelerometer</b>	
	1.15.1	Number of axis: 3	
	1.15.2	Orientation change response time for home screen: $\leq 3$ seconds	
	1.15.3	Orientation change response time for browser: $\leq 3$ seconds	
	1.15.4	Range (m/s <sup>2</sup> ) : $\geq 19.6$ (Using Z-device or android sensor tool box application. Equivalent to +/- 2g)	
	1.16	Driver for Phone Functionality with external dongle	
	1.17	Data functionality with external 2G or 3G or 4G dongle	
	1.18	Video/Photo Camera (front facing) with a resolution of 0.3 M Pixel (VGA) or higher	
	1.19	Warranty against manufacturing defect of all parts (except battery) for two years. Breakage, wear and tear, water/liquid spill damages are excluded from the warranty.	
	1.20	Protective LCD screen guard	
	1.21	Hardware reset (through pin-hole) to reboot the tablet	
	1.22	Buttons: Power, Volume up and down.	
	1.22.1	Short press of power button for Sleep Mode, long press of power button for shut down options	
	1.22.2	Advanced Android recovery option possible through key combination (Volume up and down for navigation and power button for selection). <ol style="list-style-type: none"> <li>Reboot system now.</li> <li>Wipe data/ Factory reset.</li> <li>Apply Android OS update from external SD Card.</li> <li>Backup user data.</li> <li>Restore user data.</li> </ol>	
<b>2</b>	<b>Minimum Software Requirements</b>		

	<b>Sections 2.1 through 2.6 apply only for Android. Section 2.7 applies only for GNU/Linux.</b>	
2.1	<b>Operating System, System Software.</b>	
	2.1.1	An open source operating system complying with an Open License approved by the Open Source Initiative (OSI) <ol style="list-style-type: none"> <li>1. Default installed OS should be latest Android stable version (At the time of drafting this specification, it is Android 4.2.1 (Jelly Bean))</li> <li>2. Dual bootable (through external SD Card) GNU/Linux distribution (Latest Ubuntu). Refer section 2.7 for additional OS (Linux) specification.</li> </ol>
	2.1.2	Open source generic device drivers (for both in-built hardware including Modules/ICs, touchscreen, and external peripherals mentioned in Sec. 1.7.2) for Android should be made available. The device drivers need to be enabled at kernel level.
	2.1.3	File Manager / File Browser with capabilities to archive and extract files and folders
	2.1.4	Open GL ES 2.0 Support
	2.1.5	Maximum cold boot time of 35 seconds
	2.1.6	Maximum switching time of 5 seconds between the applications Antutu (Version 3.0.3) and Nenamark (Version 2.4) as per the provided script.
	2.1.7	Maximum image (PNG, 720p with 3M minimum file size) rendering time of 2 seconds on clicking the file in the file manager
	2.1.8	Maximum video (H.264, 720p with 100 M minimum file size) rendering time of 5 seconds on clicking the file in the file manager
	2.1.9	Android DRM support should be enabled.
	2.1.10	All 'User' s' as well as 'System' applications should have writable permission to an external storage (external SD card).
2.2	<b>Document Support</b>	
	2.2.1	Rendering and editing of document formats: DOC, DOCX, PPT, PPTX, XLS, XLSX, ODT, ODP, ODS
	2.2.2	PDF viewer
	2.2.3	Text-editor and basic note taking application
	2.2.4	E-book reader should support formats such as .epub and .pdf
	2.2.5	Most commonly used Indian Language s/Scripts read/edit capabilities <ol style="list-style-type: none"> <li>1. Read and edit capabilities of Indian Languages Hindi, Kannada, Telugu, Malayalam, Tamil, Marathi, Gujarati, Punjabi, Bengali, Oriya, Bihari, Assamese, Bishnupriya ,Manipuri, Urdu, Sanskrit, Devanagari scripts and languages, and new scripts and Indic languages at OS level in the latest OS and right in the rendering engine</li> <li>2. Virtual keyboard (such as MultiLing) should be pre-installed for above languages and scripts at OS level or at Application level</li> <li>3. Should have Unicode support at OS level</li> <li>4. Default language/script should be set to English by Manufacturer. If necessary, user can set to different default language/script from the Settings panel.</li> </ol>
	2.2.6	20 KB (all text) word document(2007) to be opened in 5 seconds from the file manager
2.3	<b>Multimedia and Image Display</b>	
	2.3.1	Image-viewer supporting PNG, JPG, BMP, TIFF and GIF display
	2.3.2	Media software with the following playing and recording capabilities <ol style="list-style-type: none"> <li>1. Audio Formats: MP3, AAC, WAV</li> </ol>

			<ol style="list-style-type: none"> <li>2. Video Formats: MPEG-2, MPEG-4, AVI, 3GP</li> <li>3. Should be able to play at-least 720p. Should be able to play at a minimum speed of 30 fps</li> </ol>
	<b>2.4</b>	<b>Communication and Internet</b>	
	2.4.1	Web-browser (HTML 5(with audio and video tags support), xHTML 5 compliant, JavaScript 1.8 compliant)	<ol style="list-style-type: none"> <li>1. Flash 9 or later support (through plugin)</li> <li>2. Java support for GNU/Linux OS.</li> </ol>
	2.4.2	Audio/Video/Text Chat Conferencing (minimum three way) applications	
	2.4.3	Separate application for online video (capable of playing at least YouTube video)	
	2.4.4	E-mail client with POP, IMAP, SMTP	
	2.4.5	Calendar	
	2.4.6	Default time zone (set to IST) and default language (set to English) pre-configured at the factory	
	<b>2.5</b>	<b>Other utilities</b>	
	2.5.1	Scientific Calculator is to be pre-installed	
	2.5.2	File compression & decompression utility as part of the file manager and standalone	
	2.5.3	SD Card interface should support NFC based SD card.	
	2.5.4	Google Play and accessibility tool (similar to talkback) should be pre-installed.	
	<b>2.6</b>	<b>Developer Support</b>	
	2.6.1	All developer options supported by the Android OS to be made available	
	2.6.2	ADB via USB and Wifi to be supported. ADB developer options need to be enabled.	
	2.6.3	Device drivers for connecting the Tablet to a PC in developer mode (USB debugging) to be provided for the following OS – Windows XP/Vista/7/8	
	2.6.4	Desired applications (including talkback) should be certified with Aakash Market Place and drivers need to be preloaded by the manufacturer. ADB developer option needs to be enabled. Any application that is capable of opening and editing docs (doc, docx, ppt, pptx,xls, xlsx, odt, ods, odp) need to be pre-installed.	
	2.6.5	Factory reset through software settings	
	<b>2.7</b>	<b>Additional OS: Ubuntu Linux Specification [Dual bootable (through external SD Card) GNU/Linux distribution]</b>	
	2.7.1	Latest stable Linux kernel with all supporting drivers for tablet hardware (including touchscreen). Vendor to provide the distribution with complete source that works with the tablet.	
	2.7.2	Kernel should include drivers for generic printers, USB pen drive, USB mouse, USB keyboard, USB hub, USB to serial, USB-CDC network drivers, 3G-Modems, webcams	
	2.7.3	The device drivers need to be enabled at kernel level.	
	2.7.4	A tablet specific touch optimised linux distribution (e.g. PlasmaActive)	
	2.7.5	Linux distribution should support full hardware acceleration with OpenGL and Direct rendering (DRI2)	
	2.7.6	Battery status indicator with functional sleep mode (power saving mode, screen turns off)	
	2.7.7	Web browser with Java support (through plugin)	
<b>3.</b>	<b>Mechanical and Environmental Specification</b>		
	3.1	Weight should be less than 500g	
	3.2	Width, height and thickness should be less than 7.5", 5" and 0.75" respectively.	

3.3	Ambient operating temperature: 0 to 50 degree Celsius
3.4	Storage temperature: -10 to 65 degree Celsius
3.5	Operating humidity: 0% to 90% (Non-water vapour condensing)
3.6	Maximum tablet temperature <u>during non-charging operation</u> should be <= 45 degree Celsius at a room temperature of 25 degree Celsius
3.7	LCD touch screen withstanding a pressure of 100 gm/cm <sup>2</sup>
3.8	Scratch resistant screen for pencil/pen marks: No scratches for 0.25mm <sup>2</sup> tip exerting at 50gm/cm <sup>2</sup> and moving at a speed of 1 m/s
3.9	Bending of device: Minimum of 0.25mm/100mm
3.10	Impact resistance of 0.5G for casing and 0.25G for display. Corner impact resistance of 1G.
3.11	Protection degree: IP50 standard
<b>4.</b>	<b>Safety and other standards compliance</b>
4.1	CE certification
4.2	Material: RoHS, WEEE
4.3	Safety: IS 13252 / IEC60950-1, IEC62115
4.4	EMC: IEC 61000, CISPR22/CISPR24
4.5	Environmental & Durability: IS9000 applicable for tablet pc
4.6	Radio: EN301489-1, EN-301489-17, EN 300328, SAR
4.7	ISI certification
4.8	BIS Certification
4.9	IP50
<b>5.</b>	<b>Maintenance and Serviceability</b>
5.1	Build the following as replaceable modules for easy serviceability <u>at qualified service centres</u>
5.1.1	Battery
5.1.2	Touch-screen and LCD module
5.1.3	Front Camera
5.1.4	Speaker
5.1.5	Motherboard
5.1.6	Casing and Plastic parts for buttons
5.1.7	Charger (with 2-pin Indian plug) with the cable containing standard tablet connector
5.1.8	Entire Tablet Casing
5.2	Should support OTA firmware updates and upgrades through Aakash Market Place
<b>6</b>	<b>Other Features</b>
6.1	Ability to build on Assistive Technologies – Talkback (android accessibility tool) must be pre-installed
6.2	All spare parts should be available for repair, service, and maintenance for a minimum of 3 years.
6.3	Aakash Marketplace Support with necessary security
6.4	User manual of the hardware, operating system, pre-loaded device drivers and pre-installed applications should be provided by the manufacturer.
<b>7</b>	<b>Tablet Package Contents</b>
7.1	Tablet
7.2	External Charger/CAdapter for charging battery certified by BIS
7.3	USB adapter cable with Micro-B plug and Standard-A plug (minimum 1 m)
7.4	User Manual (Electronic form)
7.5	Application Manual (Electronic form)
7.6	Quick setup manual in print form