

Effectiveness of using High-end Mobile Gadgets in Class-room & Distance Education – An Overview

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Abstract

Education sector in India has seen immense technological advancement in the last few decades. New types of mobile gadgets have come up in the Indian electronics market – many of which can be used effectively in both class-room and distance mode of education. Higher education sector in India is slowly adopting those new technologies in course delivery; however, it is still a far way to go for Indian education sector in order to achieve effective technology-infusion in academic delivery. This paper discusses effectiveness of new gadgets like smartphones, e-book reader as well as tablets PC in both class-room as well as distance education sector in Indian perspective.

Keywords: e-book reader, smartphones, tablet PC, mobile education, distance education, class-room education, e-learning

1. Introduction

Higher education in India has expanded rapidly over the past two decades and this growth has been mainly driven by the private sector companies³. The prospect of the sector can be understood from the fact that Indian parents annually spend US\$ 4 billion to send their wards abroad for acquiring quality education⁶. The lack of availability of sufficient quality educational institutions in India attributes to the outflow of so much Indian currency to the foreign institutions. Entry of a large number of private players in the education industry has increased the availability of funding in the sector which was missing till the sector was solely dependent on the Government to run. This is attributing to the large-scale infrastructural development of the educational sector to impart quality education to greater number of students internally within the country⁶.

Education in India can be categorized into two main categories—Class-room/Campus education and Distance/Continuing Education. The most popular mode of education everywhere is the class-room/campus education where the students need to attend lectures in their institutions for a considerable period of time during the session. The campus education facilitates direct monitoring of the students' progress by the faculty members, immediate clarification of doubts as well as daily teacher-student

interaction in an ideal scenario. This mode of imparting education is teacher-centric.

Distance/Continuing education is the other mode of education prevailing in India and elsewhere. In this mode, study materials are supplied to the students at the start of the session and the students need to appear for the final examination studying the resources on their own. This mode is student-centric and it lacks direct monitoring of students' progress by faculty members, immediate clarification of doubts as well as daily teacher-student interaction in an ideal scenario. This mode is popular among students who desire to continue higher education while being in their respective profession.

The intensive use of Internet-related technologies during the last decade has brought huge modification in the role of computers, which can now be viewed as enhanced terminals through which several distributed applications and services can be accessed. One of the most significant service that can be provided through the internet is the e-learning^{1,2,4,5}, which aims at increasing the dissemination of knowledge by allowing anyone connected to access lessons on a subject they are interested in. The advent of e-learning has opened up lot of opportunities for both mode of education in Indian perspective. The major advantage of e-learning is that it uses information and communication technology (ICT) which is becoming more advanced and cheaper day-by-day.

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New devices like e-Readers, smartphones and tablet PCs have come up in the electronic market increasing the convenience of the users to get desired information in no time and facilitating improved communication among the users. The availability of these devices in the market has opened up new dimensions in the activities like reading, travelling, talking and entertainment etc. Just twenty years back in India, nobody could imagine that after few years it would be easy for them to talk to their friends and acquaintances based 1000+ KM apart while on travel and also it would be possible to see them live. It was also not imaginable for them that they would be able to view movie and listen to music carrying just a small notebook size instrument with them while on traveling. But these are common things today. These new devices had brought huge opportunities for us and if these can be properly used, it has the ability to change the way education is imparted these days.

An e-book reader, also called an e-book device or e-reader, is a portable electronic device that is primarily designed for the purpose of reading digital books and periodicals (Wikipedia definition). An e-book reader is similar in form to a tablet computer. A tablet computer typically has a faster screen capable of higher refresh rates which makes them more suitable for interaction. The main advantages of the e-book readers are better readability of their screens especially in bright sunlight and longer battery life. This is achieved by using the e-ink technology to display content to readers. Apart from the reading, the following activities are possible in the e-reader –

- Listening Music
- Reading POP3/IMAP Mails
- Recording Memos
- Playing 2D games like Minesweeper etc.
- Visiting some specific sites in the internet through WiFi or 3G connectivity

Several experiments are going on around the globe in order to replace the existing paper-back hardcopies by the e-book readers in the educational institutions (Articles – Catalanello, 2010; Ash, 2010; Ganesh, 2010). As per Pilkington (2011), e-readers are the future of public education. It can be said that devices like e-reader is a very effective which can be incorporated in the course delivery removing paper-backs. It will relieve the students a lot in regard to carrying large books to the institutions if properly can be incorporated and will save lots of trees which are used for producing paper. Increasing cost of printing books can be mitigated if such devices are used on a large-scale. Effectiveness of using these devices has been discussed in the paper in the latter sections.

A tablet personal computer (tablet PC) is a portable personal computer equipped with a touch screen as a primary input device

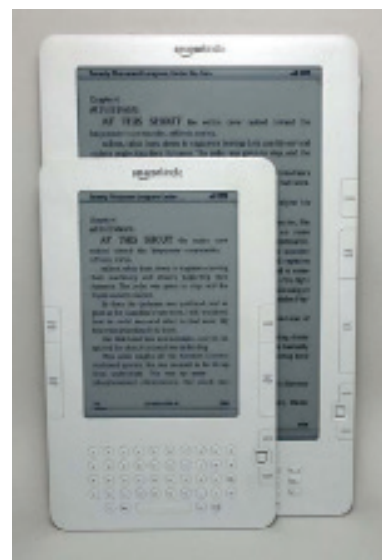


Figure 1. e-Reader device.

and it is designed to be operated and owned by an individual (Wikipedia definition). The term was made popular as a concept presented by Microsoft in 2001, but tablet PCs now refer to any tablet-sized personal computer, even if it's not using Windows but another PC operating system. Tablets may use virtual keyboards and handwriting recognition for text input through the touch screen. All tablet personal computers have a wireless adapter for internet and local network connection. Software applications for tablet PCs include office suites, web browsers, games and a variety of applications. However, since portable computer hardware components are low powered, demanding PC applications may not provide an ideal experience to the user.

Ballew and Hursh in their articles describe the effectiveness of using the tablet PCs in the day-to-day school and college education. Hursh provides a vivid description of how the tablet PCs can be more advantageous than the notebook PCs in performing several important activities in the class-room. The tablet PC can perform several roles in a class-room situation –

- Students can use it as the e-reader
- Teachers can use it as an electronic writing pad and no PC is needed
- Teachers and students can use it as PC also

Tablet PC is more like a portable computer with host of features –

- Reading text documents as can be done in e-reader
- Creating or editing PowerPoint or other Office presentations
- Listening Music
- Watching videos



Figure 2. Tablet Personal Computer.

- Surfing the internet
- Playing games
- Communicating with friends and colleagues using 3G network

And many more...

A smartphone is a mobile phone that offers more advanced computing ability and connectivity than a contemporary feature phone (Wikipedia definition). Smartphones and feature phones may be thought of as handheld computers integrated with a mobile telephone, but while most feature phones are able to run applications based on platforms such as Java ME, a smartphone usually allows the user to install and run more advanced applications. Smartphones run complete operating system software providing a platform for application developers. The next level of mobile phones beyond smartphones has been called Nirvana Phones. These smartphones can be docked with an external display and keyboard to create a desktop or laptop environment.

Herrington (2008) describes how the adult educators can use the smartphones to create digital teaching resources. The article “1” gives a vivid description of how the smartphones can be used in education. The smartphones can be used for –

- Reading text documents
- Editing text and presentation
- Checking e-mails
- Surfing internet
- Communicating with friends and colleagues through online chat
- Listening music
- Watching video
- Finding user position using Map and GPS

And many more activities



Figure 3. Smartphone.

2. Usefulness of the Gadgets in Education Sector

Indian education sector is broadly classified in two sectors – class-room or conventional mode of education and distance education. As mentioned earlier, class-room education is the most conventional mode where regular students use to attend F2F lectures and teachers and students interact regularly. The distance education is also a popular mode through which mainly the working students increase their educational qualification.

2.1 Use of Gadgets in Class-room or Conventional Mode of Education

F2F teaching and immediate clarifications of doubt are the most important activities that use to take place in our conventional mode of education. Let us think about the other activities that use to take place in the conventional mode of education –

- Giving homework and assignments to students
- Student-teacher communication outside class-room
- Student-student communication outside class-room
- Serving regular info about notice and announcement
- Library services

Pal (2011) has conceptualized a model using which the mobile technology can be used in regular class-room teaching for better course delivery. F2F teaching is the most important feature of class-room teaching. Hursh in his article gives a vivid idea about how the tablet PC can be integrated in class-room teaching –

- The instructors can “draw” directly on the presentation using the stylus. While it is possible to draw with a mouse, drawing with a pen-like artefact is easier for most people.
- The tablet can be used in either horizontal or vertical modes. This is convenient for displaying material that may have originally been in portrait format.

Table 1. Comparison of the 3 devices as per the technical features			
Feature details	e-Reader	Tablet PC	Smartphone
Screen type	e-ink screen	TFT screen	TFT screen
Convenience to Eyes	Very much convenient – no eye strain	Can have eye strain after one and half hours continuous reading	Can have eye strain after one and half hours continuous reading. Screen-size is less so not possible to read anything long document for a long time.
Visibility in Day-light	Convenient to read even under bright sunlight	Difficult to see under bright sunlight (screen being TFT)	Difficult to see under bright sunlight (screen being TFT)
Visibility in Dark	Not possible to read in dark	Reading in dark possible	Reading in dark possible
Navigability	Keys / Touchscreen	Touch screen	Touch screen
Reading Text in Device	Very good	Very good (except the eye strain problem)	Not so Good as screen-size is very less
Zooming	Key-based / little inconvenient	Touchscreen (very much convenient with finger touch)	Touch screen (convenient with finger touch)
Taking Notes	Key-based (sometimes tiresome) – not at the point required	Excellent	Not possible
Navigation Page to Page	Separate Keys – very convenient	Touch-screen – very convenient	Touch-screen – not so convenient screen-size being very less
Reading Pages with Pictures	Not so clear – difficult to read in .epub format	Very good – not much difference from original page as the page is coloured	Good - not much difference from original page as the page is coloured. Only problem is that the screen-size is less.
Colour	Grey-scale	Colour screen	Colour screen
Battery	Can be used for 6/7 days without any recharge	Maximum continuous reading time 5/6 hours without recharge	Maximum continuous reading time 1 and half days
Weight	Convenient	Convenient	Convenient
Other Features	MP3 Audio, internet through Wi-Fi	MP3 Audio, Video, animation, internet through Wi-Fi and 3G, GPS	MP3 Audio, Video, animation, internet through Wi-Fi and 3G, GPS

- Tablet PCs tend to be ultra-light and have long battery life. This is important if an instructor may be carrying the computer long distances or may be away from electrical outlets for long periods of time. Classes which use field work may specially be benefitted from this.

The below table provides a bird's eye view on the usefulness of the three gadgets in performing different activities required in a Face2Face teaching –

The tablet PCs are most useful in the class-room education. Though the modern days smartphones are having almost all the functions available in the tablet PCs, however, the small screen-size makes it little inconvenient to read long text documents. E-readers are mainly useful for reading long text documents like books without any eye-strain, however, it cannot perform the activities which the other two gadgets can do.

2.2 Use of Gadgets in Distance Education

Distance education is gradually becoming a popular mode of course delivery due to the entrance of more and more young people in the BPO, IT and other sectors. It is not possible for these young people to attend regular classes but higher qualification is extremely needed for being promoted in the organization. This has led to the growing popularity of the distance education courses.

It is a fact that the distance education degree is not seen in the same eye as a regular university degree. The main reason lies behind the quality of education imparted in the distance mode as no F2F monitoring is there. Even now, in India, the distance education students mainly read the text-books (study materials) given to them before examination and appear for the examination to obtain final degree. Hence, there persists a negative

Table 2. Usefulness of the three gadgets in class-room education			
Activity	Smartphones	Tablet PC	e-Reader
F2F teaching	<p>Students' Perspective – Students can promptly answer to any MCQ question asked by the student during the class-room (The smartphone will work like Clickers as mentioned in Deeganet al. (2010))</p> <p>Advantage – It will decrease the answering time and the classes will be more interactive and productive</p>	<p>Teachers' Perspective –The teachers can use the tool as a teaching aid as mentioned by Hursh. It can also be used as a communication medium for asking specific MCQ questions and getting immediate response.</p> <p>Students' Perspective – The students can use the tool for seeing the softcopy text books and taking the notes. Students can use it like Clickers for answering the questions asked by the teachers.</p> <p>Advantage – It will make the classes more interactive</p>	<p>Student Perspective - The students can use the tool for reading the softcopy text books and taking the notes.</p> <p>Advantage – The students don't need to carry heavy books as all those books can be loaded in the small pad-size e-reader</p>
Homework and Assignment	<p>Teachers' Perspective – Teacher can send the homework and assignments immediately to the students in the click of a button.</p> <p>Students' Perspective – Students can send back the answered homework and assignment immediately in the click of a button.</p> <p>Advantage – Reduce the pain of checking the assignment in hardcopy. In case of MCQ assignments, the answers can be scored automatically.</p>	<p>Teachers' Perspective – Teacher can send the homework and assignments immediately to the students in the click of a button.</p> <p>Students' Perspective – Students can send back the answered homework and assignment immediately in the click of a button.</p> <p>Advantage – Reduce the pain of checking the assignment in hardcopy. In case of MCQ assignments, the answers can be scored automatically.</p>	Not much useful for this activity
Student-teacher interaction outside class	<p>Teachers' perspective – Teachers can send note, videos, audios for reference to the students apart from plain text in order to improve quality of education imparted. Teachers can also put information in some site like Orkut community and other Social Networking sites using the smartphones so that students can get the inform</p> <p>Students' Perspective – Students can send queries, data, assignments and other documents using the smartphones to their teachers when they are not actually present in the institution</p> <p>Advantage – This will increase communication between the teachers and the students</p>	<p>Teachers' perspective – Teachers can send note, videos, audios for reference to the students apart from plain text in order to improve quality of education imparted. Teachers can also put information in some site like Orkut community and other Social Networking sites using the smartphones so that students can get the inform</p> <p>Students' Perspective – Students can send queries, data, assignments and other documents using the smartphones to their teachers when they are not actually present in the institution</p> <p>Advantage – This will increase communication between the teachers and the students</p>	Teachers and students can use the e-mail facility to communicate among themselves.
Student-student communication outside class	<p>Students' Perspective – Students can be in touch with their friends even when they are in home. They can exchange notes, share information, videos and other enriched resources among themselves at ease.</p> <p>Advantage – This will enhance the knowledge of the students.</p>	<p>Students' Perspective – Students can be in touch with their friends even when they are in home. They can exchange notes, share information, videos and other enriched resources among themselves at ease.</p> <p>Advantage – This will enhance the knowledge of the students.</p>	Students can share text information through e-mail
Serving Regular info about notices and announcements to the students	<p>Student Perspective – They are getting info about important deadlines and announcements very conveniently without need to go to the noticeboard. They are getting the info even when they are not attending the classes.</p>	<p>Student Perspective – They are getting info about important deadlines and announcements very conveniently without need to go to the noticeboard. They are getting the info even when they are not attending the classes.</p>	Can be done through e-mail
Other Activities	<p>Student Perspective –Students can access additional resources like online journals, sites, library site, enriched educational video sites like Khan Academy to increase their knowledge in a click</p>	<p>Student Perspective – Students can access additional resources like online journals, sites, library site, enriched educational video sites like Khan Academy to increase their knowledge in a click</p>	Students can download new reference books and also can listen audio files

attitude among the prospective employers towards the fresher students holding the distance education degrees at the time of the interview.

If we analyse what is lacking in the distance education, we can come up with several factors differentiating distance education from the regular education –

- No F2F teaching
- No teacher-student interaction
- No doubt clarification possible
- No communication among the fellow students
- No campus experience
- No scope for acquiring added knowledge through reading other related books or going through related resources

All these factors are affecting the image of a distance education degree before the eyes of the employers. Though there were not much scope for overcoming these 10 years back, however, implementation of online learning and also introduction of new gadgets and technologies have facilitated much scope to enhance the quality of education imparted through distance mode. If these new technologies and gadgets can be used properly, it is very much possible to reduce the gap that is currently prevalent between a distance and regular education degree. Several online technologies has come up using which it is possible to generate somewhat virtual campus experience among the distance education students.

2.3 How Technology can Enhance the Quality of Education Imparted through Distance Learning?

- (i) Facilitating F2F teaching experience through virtual classrooms in the internet – Several course delivery platforms have come up like OnSync, Webex and others through which students can see the teacher live, can listen to the lectures of the teacher and can see the presentations being shown by the teacher. Students can ask questions to the teacher live through text chat and teachers use to answer orally. Some of the leading distance education providers have already started the facility for its students.
- (ii) Facilitating Teacher-Student Interaction – The Internet and e-mail has opened up the gateway for convenient exchange of messages among the students and the teachers. The students can easily send their problems or doubts for clarification from the teachers through e-mail or can post it in the e-learning portal forum for possible reply by the respective teacher.
- (iii) Facilitating Doubt Clarification – As mentioned earlier, there is enough scope of using the internet and e-mail for clarifying the doubts of the students. Students can directly

communicate with the teachers or can post questions in the e-learning portal forums to get their doubts clarified.

- (iv) Facilitating Communication among Students – The distance learning forum students can find their fellow students spread all over the country in their e-learning portal site. They can increase communication among themselves through exchanging messages. Some of the distance education providers have started some e-learning sites in order to facilitate virtual campus experience among the students.
- (v) Facilitating Campus Experience – In the e-learning site, there are several virtual places where students of different programs can interact with their fellow students. Students of one program can know whereabouts of his class-mates which was not possible before in the distance education. The facilitation of communication among the fellow students has generated virtual campus experience among them. Few distance learning providers are providing such facility in their e-learning portals to enhance the student learning experience.
- (vi) Facilitating Additional Enriched Learning Resources – Internet is the store-house of information wealth. Now, it is possible for the distance learning students to get additional resources for enhancing knowledge through the e-learning portal and other internet resources. Previously, the students use to get only the study materials reading which they use to appear for the examination. However, due to the introduction of the e-learning portal by few distance learning providers, the students are getting numerous resources like PowerPoint presentations, interactive quizzes, videos, audios, forum postings, case studies, assignments, FAQs, expert articles, expert blogs, animations, news briefs, glossaries, wiki and e-books. The students are getting enriched videos in the internet like the Khan Academy videos (www.khanacademy.com) seeing those they can understand a complex concept very easily. If the students can properly utilize these resources, the students will acquire enough knowledge which will nowhere be less than what they will acquire in a campus-based program.

The introduction of the gadgets can make distance education experience more enriching and convenient. The e-reader can be useful as an alternative of the hardcopy study material. The distance education students are majorly working professionals who need to travel regularly from place to place. The e-reader is very much useful for the students in this respect as they can carry all their study materials (including PowerPoint presentations) in a very light writing pad sized device. However, it is not possible to view enriched media resources like videos and animations in the e-reader device.

The below table provides a bird's eye view on the usefulness of the three gadgets in respect of the distance education –

Table 3. Usefulness of the three gadgets in distance education

Activity	Smartphones	Tablet PC	e-Reader
Attending Online Teaching Sessions	It is possible to attend online sessions in OnSync or other web-conferencing platforms through the Smartphones downloading some applications	It is possible to attend online sessions in OnSync or other web-conferencing platforms through the Tablet PC downloading some applications	It is not possible to attend such session through e-Reader
Communicating with the Online Teacher	It is very much easy to communicate with the teachers either surfing the e-learning portal forum page or directly sending mailers or messages to the respective teachers	It is very much easy to communicate with the teachers either surfing the e-learning portal forum page or directly sending mailers or messages to the respective teachers	e-Reader is not a suitable platform for communication
Doubt clarification	Students can clear their doubts themselves through visiting different resources available in the internet or through communication with the teachers	Students can clear their doubts themselves through visiting different resources available in the internet or through communication with the teachers	e-Reader is not a suitable platform for doubt clarification
Communicating with the Fellow Students	Students can easily visit the e-learning portal and find their classmates using the device and can communicate with them through different messengers or social networking sites like Facebook and Orkut etc	Students can easily visit the e-learning portal and find their classmates using the device and can communicate with them through different messengers or social networking sites like Facebook and Orkut etc	It is not good as communication medium
Enabling Campus Experience	This is an excellent medium for communication and hence it facilitates virtual campus experience through building a virtual communication network among the students	This is an excellent medium for communication and hence it facilitates virtual campus experience through building a virtual communication network among the students	It is not good as communication medium
Viewing Enriched Learning Resources	Students can view videos and animations in the device	Students can view videos and animations in the device	It is not possible to view videos and animations in the device

The tablet PCs are most useful in the distance education. Though the modern days smartphones are having almost all the functions available in the tablet PCs, however, the small screen-size makes it little inconvenient to read long text documents. E-readers are mainly useful for reading long text documents like books without any eye-strain, however, it cannot perform the activities which the other two gadgets can do. E-reader is not at all a communication device. It is mainly a reading device. But, the smartphones and tablet PCs can take many roles. However, a good quality tablet PC costs much more in comparison to an e-book reader.

3. Conclusion

Tablet PC and smartphones can take up multiple roles as communication and reading device. However, e-reader is more appropriate as a reading device. In distance education scenario, it is more useful to go for a good quality tablet PC as it serves many purposes which can enhance the ultimate student experience in distance learning. Smartphones are not so good as a

reading device. The eye-strain problem may occur in the tablet PCs in case of using it constantly for a long time. In class-room education also, tablet PCs may serve many roles. However, cost aspect may influence the use of these devices in the distance as well as campus education.

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