SCHOOL FOR ALL IN ONE BOX (SAOB): PROVIDING EDUCATION AS A SERVICE (EAAS) TO THE BOTTOM OF THE PYRAMID (BOP) PEOPLE

ABSTRACT

With the advancement of information and communication technology (ICT) now-a-days education is transforming throughout the world. Cloud computing has added a new dimension in this transformation. Cloud computing is providing education as a service (EaaS) and is delivering education to the remote students. This service is making education available to the students at any place and at any time. However the matter of disgrace is that the bottom of the pyramid (BoP) people is far behind enjoying the facilities of EaaS. Most of BoP people lives in rural villages, or urban slums and shantytowns, and they have little or no formal education. Traditional education system failed to provide them proper education. Hence EaaS can be used to remove their illiteracy. However they do not have any necessary equipment or money that is necessary for accessing EaaS. A portable box will design that will consist of all equipment necessary for having access to EaaS. This box will carry by a representative from door to door to provide education to the bottom of the pyramid people (BoP) which will help them to turn over their luck with better life without their own internet facility and spending a large amount of money.

Keywords: BoP, EaaS, Education, Cloud SAOB

1. INTRODUCTION

Cloud computing [1][2] has emerged as a global infrastructure for applications by providing large scale services through the cloud servers. The cloud makes it possible for anyone to access any information from anywhere at any time. It provides several services including Software as a Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS) etc [3].

Now-a-days the massive proliferation of affordable computers, Internet broadband connectivity and rich education content has created a global phenomenon in which information and communication technology (ICT) is being used to transform education. Cloud computing is beginning to play a key role in this transformation by providing Education as a Service (EaaS) [4]. EaaS refers to the delivery of education to the remote students using cloud infrastructure.

However, like all other IT solutions, the benefits of EaaSare only enjoyed by the middle class and higher class people and remain unreached to the bottom of the pyramid (BoP) people. There are about 4000 million BoP people in the world, which is about 68.37 percent of the whole population of the world [5]. These BoP people suffer from several socio-economic

problems including huge population, poverty, crime etc. A common solution to all these problems is proper education. However these BoP people remain out of education due to lack of educational equipments or communication system with their surrounding schools, colleges and another organizations.

In perspective of Bangladesh the literacy rate is about 65% [6] that means about 35% of its population is out of education and it's huge. About 34% children who are eligible to go pre-primary school are not attending school, 16.2% eligible children are not attending primary school, 30.7% eligible children are not going to lower secondary school [7]. An alarming fact is that about 40% of the children who are attending primary school drop out before completing their primary education [7]. And finally only 27% of all the students can reach to higher education [8].

According to the 2015 Global Monitoring Report – "Education for All 2000-2015: Achievements and Challenges"; Bangladesh is one of the 20 countries who are very slowly achieving the goal of "Education for All" program of UNESCO. This report also said that Bangladesh is lagging behind in balancing the participation of male and female children in education and lagging far behind in removing adult illiteracy.

The main reason behind this problem is poverty. Most of the children get out from school to work for earning money. Female children become the victim of early marriage for lack of education. This is not only the scenario of the rural areas but the same scenario can be found in the slums of the metropolitan areas. Also the number of educational institution is not adequate as per the number of students. Although government is providing free education and scholarship to the poor children for solving this problem but these initiatives can not bring remote areas under it for having no educational organization near them and proper communication with them.

UNESCO suggested to the 20 slow improving countries to add more 2 thousand and 200 crores US dollar with their government expenditure for education sectors within 2030 to achieve the goal. Since year 2000 many of these countries added more fund for the expenditure of the education section. However the scenario of Bangladesh is contrary. Previously the educational expenditure was about 2.3% of the total governmental expenditure but now it is about 2.1% [9]. In fact it's really very difficult for the poor countries to provide more funds for the education sector.

Hence by considering the facilities of EaaS and the need of providing proper education to the BoP people this research will focus on providing proper education to the BoP people using EaaS. A portable school will design to make education available to anywhere and at any time. Students will not to go to school for education rather school will reach door to door to give them education. This school will act as a primary school, as a secondary school, as a higher secondary school and also as a university. This school will also be able to teach the adult people. It will be a School for All in One Box (SAOB).

2. LITERATURE REVIEW

Several organizations are providing EaaS including Microsoft and Google. This section includes a brief explanation of the traditional EaaS structure and a brief survey about the BoP people.

2.1 Education as a Service (EaaS)

Over the past few decades, the role of technology in education has continually evolved. In classrooms and lecture halls, 'chalk and talk' has increasingly been complemented by digital

tools and platforms which typically vary in scope and sophistication according to where the student is on his or her education journey as seen in Figure 1 [10].

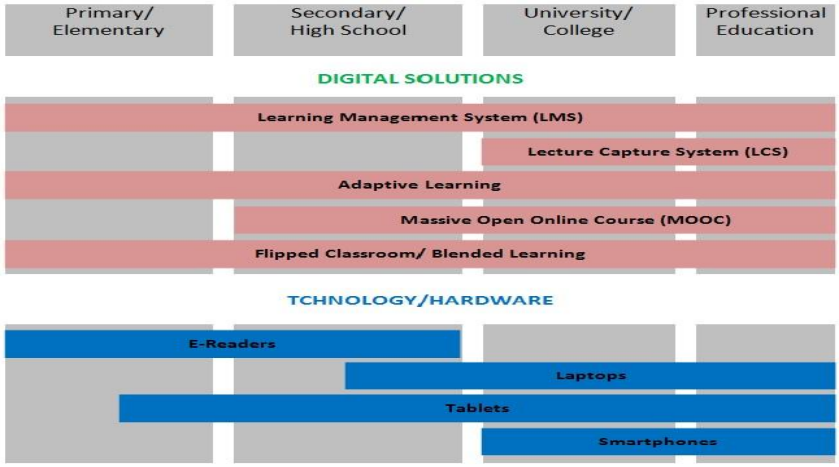


Fig. 1. Technology and digital solutions used in education today

By making ICT more affordable to implement and easier to integrate into classrooms worldwide, education can be transformed — and students across the globe can develop the critical skills they need to compete and prosper in the today's information society. Education as a Service (EaaS) is one such digital solution that is transforming education.
Education as a Service (EaaS) is providing through education cloud. Education cloud consists of two layers as shown in Figure 2 [11].

2.1.1 User Services

The "user services" shown in Figure 2 illustrate a few of the many education specific and generic services the education community can access from devices such as laptops and PDAs. Education cloud provides following services to the users.

- An eAssessment service for managing student assessments
- Grade book, roster, lesson plan and classroom management services for teachers
- Content management services that teachers use to assign curriculum content to students and that students use to access the assigned content
- An online community service that teachers use to interact with peers and share lesson plans
- A professional development service that teachers use to manage their career development path and become more proficient on the use of technology in theclassroom.

2.1.1 IT services

In Figure 2, the bottom two layers describe the IT services that define the infrastructure of the education cloud. These layers include:

- Physical resources such as client devices, school servers, the school network, MoE servers, national communication network, storage devices, etc.

- Virtual resources that simplify the management and access of the physical resources by aggregating the physical resources into a collective pool of resources. This aggregation and pooling is commonly referred to as virtualization.

The real power of education clouds becomes evident when viewed from a user's perspective. As depicted in Figure 3, a set of users (including students, teachers, parents and others) can access a variety of education cloud services, using whatever device or devices they have access to (laptops, desktops, PDAs, etc.) [11].
The cloud computing model is depicted in Figure 4, which shows a telecommunications company, or Telco, serving as a services integrator for higher-education research [11]. In the example shown in this figure, three universities are engaging in oil and gas research, and each university has its own IP (in the form of services) that it is making available for the collective research. The Telco integrates the IP from the three universities, along with the Telco's own value-added services and other cloud services that are publicly available.

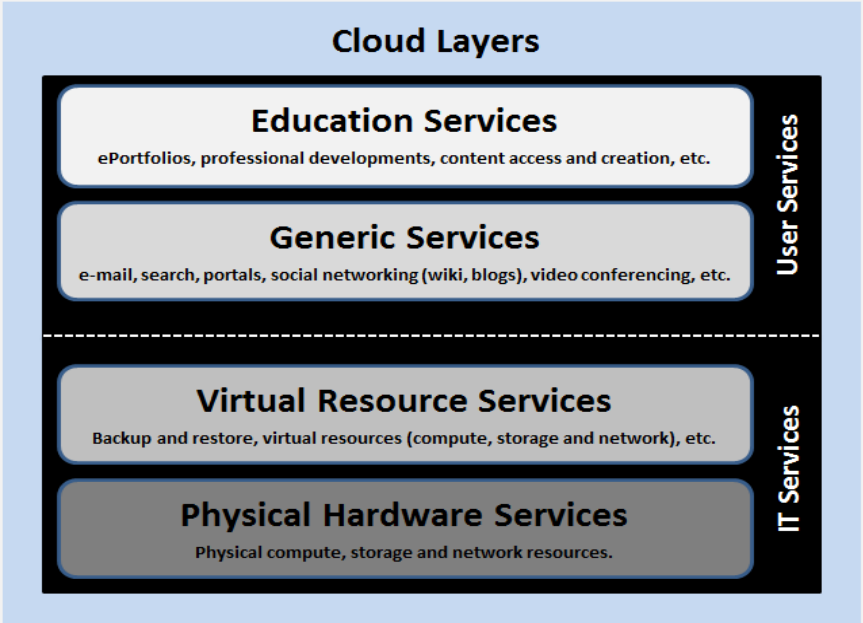


Fig. 2. An education cloud consisting of both user services and IT services.

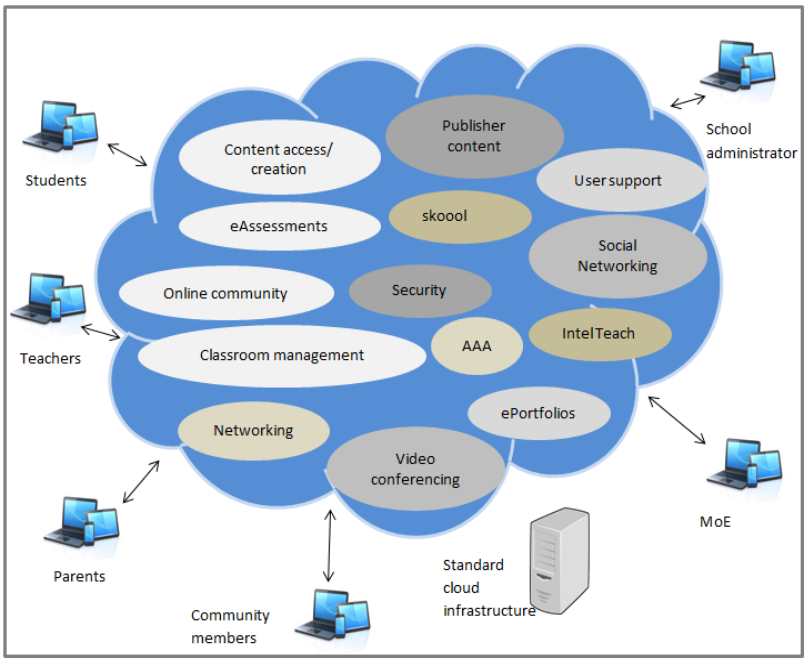


Fig. 3. K-12 education cloud example — user's perspective

The result of the services integration illustrated in Figure 4 is a virtual collaboration environment (VCE). When viewed from a user's perspective in Figure 5, this VCE is shown to be a powerful tool that allows researchers to access at any time, and using any device a wide range of collected cloud based services.

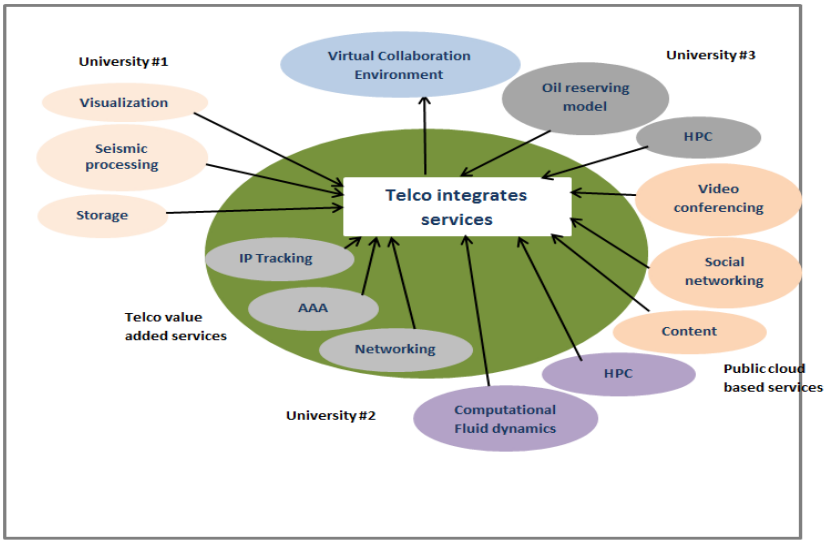


Fig. 4. Higher-education cloud example — provider's perspective

The researchers can focus on their research without concern for where the services originate or where and how they are running.

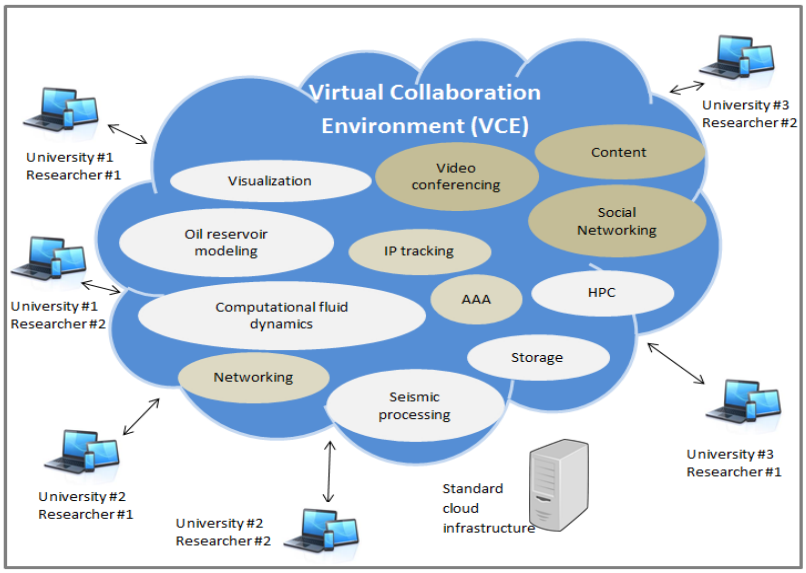


Fig. 5. Higher education cloud example — user's perspective

Cloud computing can help communities and nations to transform education. An entire world of knowledge can now be made available to teachers and students through cloud-based services that can be accessed anytime, anywhere, from any device.

2.2 Bottom of the Pyramid People (BoP)

The wealth distribution around the world is not identical. The world economic shape looks like a pyramid as shown in Figure 6 [12]. At the top of the world economic pyramid there are about 75 to 100 million people who are tier 1 consumers. This is a cosmopolitan group composed of middle- and upper-income people in developed countries and the few rich elites from the developing world. In the middle of the pyramid, in Tiers 2 and 3, there are poor customers of developed countries and the rising middle classes in developing countries.

Now consider 4 billion people in Tier 4, at the bottom of the pyramid. Their annual per capita income based on purchasing power parity in U.S. dollars is less than $1,500, the minimum considered necessary to sustain a decent life. For well over a billion people roughly one-sixth of humanity per capita income is less than $1 per day. Even more significant, the income gap between rich and poor is growing. According to the United Nations, the richest 20 percent in the world accounted for about 70 percent of total income in 1960. In 2000, that figure reached 85 percent. Over the same period, the fraction of income accruing to the poorest 20 percent in the world fell from 2.3 percent to 1.1 percent. According to World Bank projections, the population at the bottom of the pyramid could swell to more than 6 billion people over the next 40 years, because the bulk of the world's population growth occurs there. Most Tier 4 people live in rural villages, or urban slums and shantytowns, and they usually do not hold legal title or deed to their assets (e.g., dwellings, farms, businesses).

They have little or no formal education and are hard to reach via conventional distribution, credit, and communications.

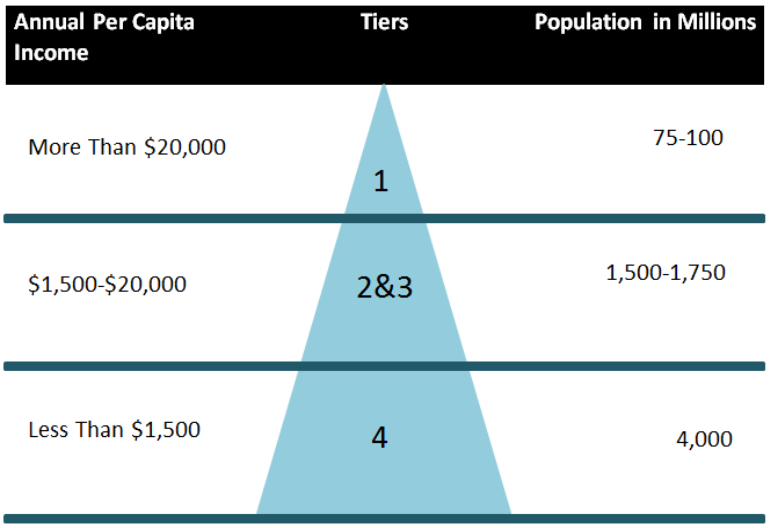


Fig. 6. The world economic pyramid.

3. RESEARCH GAPS

Traditional education is playing an important role in spreading education throughout the world. Traditional Eaas is designed to serve the same purpose. However a large portion of the world population is still out of education. In this section, the reasons will find out why traditional EaaS and traditional education system failed to remove illiteracy.

3.1 Traditional EaaS

Education as a Service (EaaS) can only be accessed by the people who have laptop/desktop/pda/mobile phone/tablet etc and have strong internet connection. Another factor is financial ability. For enjoying the facility of EaaS one has to pay in a monthly basis or pay as a service basis. Now the BoP people neither have a laptop/desktop/pda/mobile phone/tablet etc nor have a strong internet connection. Moreover, they don't have financial ability to pay for the service. Hence they remain far behind having the facility of EaaS. This situation is depicted in Figure 7.
The traditional EaaS provide education at any time and at any where but it is out of scope of the BoP people.

3.2 Traditional Education System

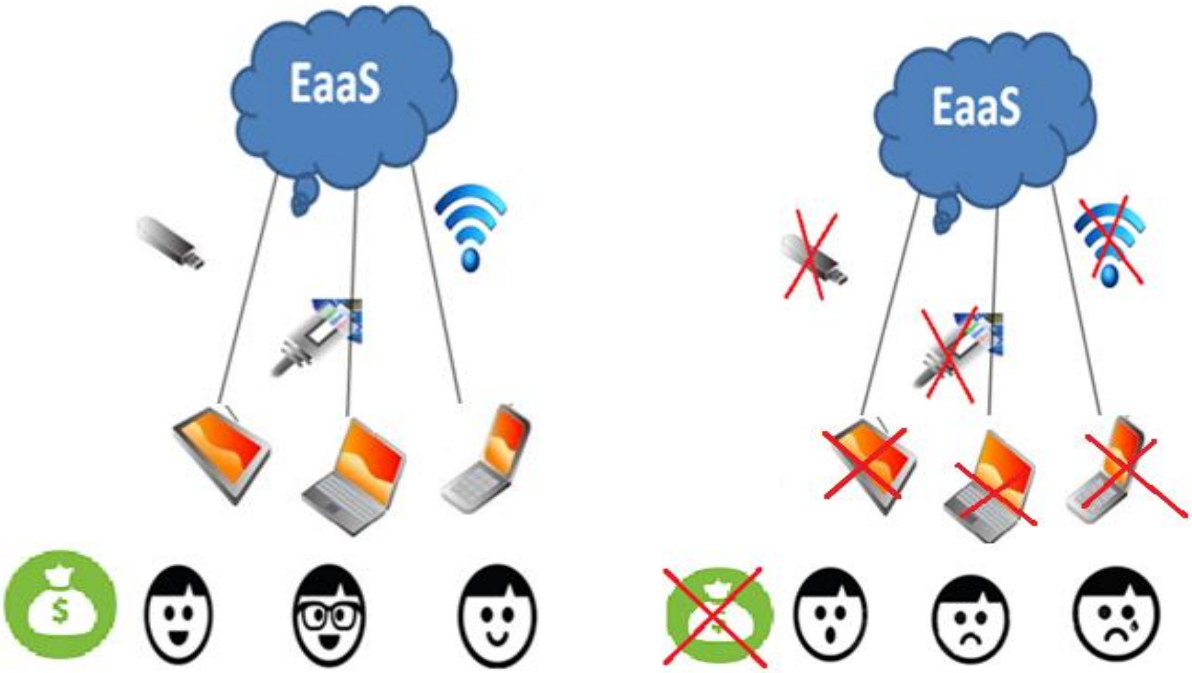
In Bangladesh, government is providing schoolarship for the poor children to solve the drop out problem. However it's not working to it's best. The poor children get out from the school and start working for earning money. Some of them have to earn money for maintaining their family. Hence the money that is providing by the government as scholarship is not enough for them. Some of the children have their will to study but they don't get enough time to attend school because they have to work all the day long to support their family. Most of

them remain free at night. Hence during this time if any school is availabe to them then they can study. However in our existing education system there is no such facility.
The traditional education system is a bit accessible by the BoP people but does not provide education at any time or at anywhere.

4. OBJECTIVES

The main objective of this research is to provide proper education to the BoP people by facilitating EaaS to them. To do this we have to fill the gaps mentioned in section III. The key objectives of this research are listed below.

- Facilitating the service of EaaS to the BoP people.
- Making education accessible to each and every people with the help of EaaS at low of cost.
- Making education available at any time and at anywhere with the help of EaaS.



(a) (b)

Fig. 7. (a) People other than BoP enjoying EaaS (b) BoP people are out of EaaS

5. KEY CHALLENGES

There are several challenges and some of these are listed below.

- **Public awareness:** The challenges of such systems are mainly people awareness, student awareness towards creation of group of learner.
- **Lack of technical people:** In poor countries there is a lack of dedicated information technology (IT) people to resolve technical issues related to the maintenance and operation of the system.
- **Lack of electricity:** In developing countries large areas are still without a reliable supply of electricity. An estimated 1.2 billion people – 17% of the global population – did not have access to electricity in 2013, 84 million fewer than in the previous year. Many more suffer from supply that is of poor quality. More than 95% of those living without electricity are in countries in sub-Saharan Africa and developing Asia, and they are predominantly in rural areas (around 80% of the world total). While still far from complete, progress in providing electrification in urban areas has outpaced that in rural areas two to one since 2000 [13]. In Bangladesh about 40.4% people are out of electricity [14].
- **Availability of strong internet connection:** About 60% of the world population is still out of internet connection [15]. Hence, it will be challenging to provide EaaS to BoP people.
- **Financial challenge:** One of the greatest challenges is balancing educational goals with economic realities.
- **Content developers:** The bulk of existing ICT-based educational material is likely to be in English or of little relevance to education in developing countries especially at the primary and secondary levels. There is a need to develop educational content that will adapt with the prospective countries. Hence there is a need of content development specialists such as instructional designers, scriptwriters, audio and video production specialists, programmers, multimedia course authors, and web-developers.

Although all the challenges mentioned above are difficult but they are not insurmountable.

6. METHODS

For providing EaaS to the BoP people there will need a central education cloud, SAOB box and relevant software tool and this section describes these.

6.1 Central Education Cloud

There will be a central cloud through which the whole system will be controlled. This cloud will consist of hardware, software and other cloud infrastructure to provide EaaS to the BoP people. Instead of traditional classrooms, education cloud will facilitate online teaching through virtual classrooms. Students from different places can be taught together. Also more than one course can be taught at the same time. For example, while one teaching primary school students other can teach the adults at the same time.

6.2 SAOB Box

It will be a portable box to meet our objectives and to fill the gap of EaaS and traditional education system. This box will contain all the equipments that are necessary for accessing the service of EaaS. We named this box as School for All in One Box (SAOB).

This box will equip with laptop/tablet computers with associated software, keyboards, touch pad, audio-visual equipment including data portable projector and screen, educational CD/DVD/Video, amplifier with surround sound, high speed internet access device, microphone, headphone, printer, scanner and video conferencing unit as shown in Figure 8.

This box will carry out by a representative. He/She will bring it door to door to provide education to the children, to the women, to the adult and also to the young people. He/She will bring it to them whenever and wherever they want.

Fig. 8. Proposed SAOB.

6.3 Software Tool

A software tool will develop to assist teachers to take online classes and to provide a user friendly classroom environment to the students. BoP people will get access to the online classes through this software tool.

Finally the education cloud along with the SAOB and software tool will provide EaaS to the BoP people as shown in Figure 9.

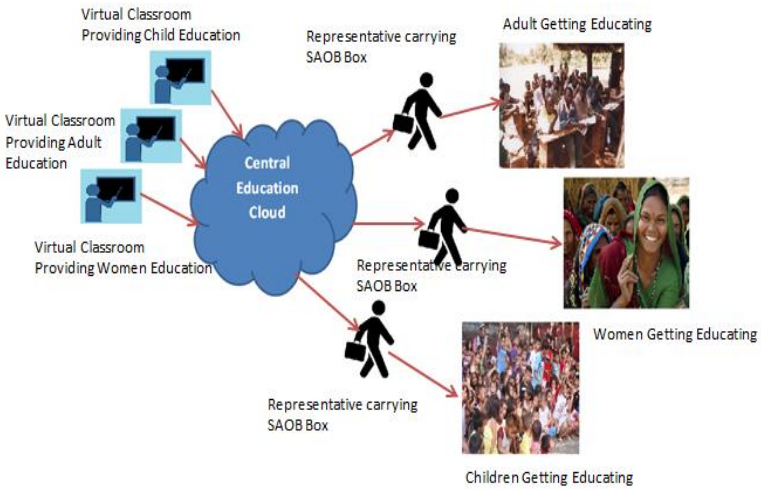


Fig. 9. Proposed education cloud providing EaaS to the BoP people with the help of SAOB.

7. POSSIBLE RESULT

The proposed SAOB box will act as an intermediatory between the BoP people and the EaaS as depicted in Figure 10. Now the BoP people don't need to have laptap/desktop/PDA/tablet etc, don't need to have internet access, don't need to have much money but they can enjoy the facility of EaaS.

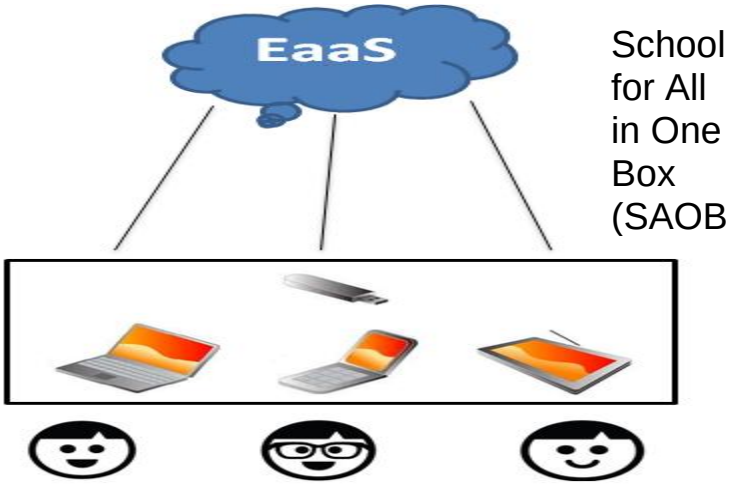
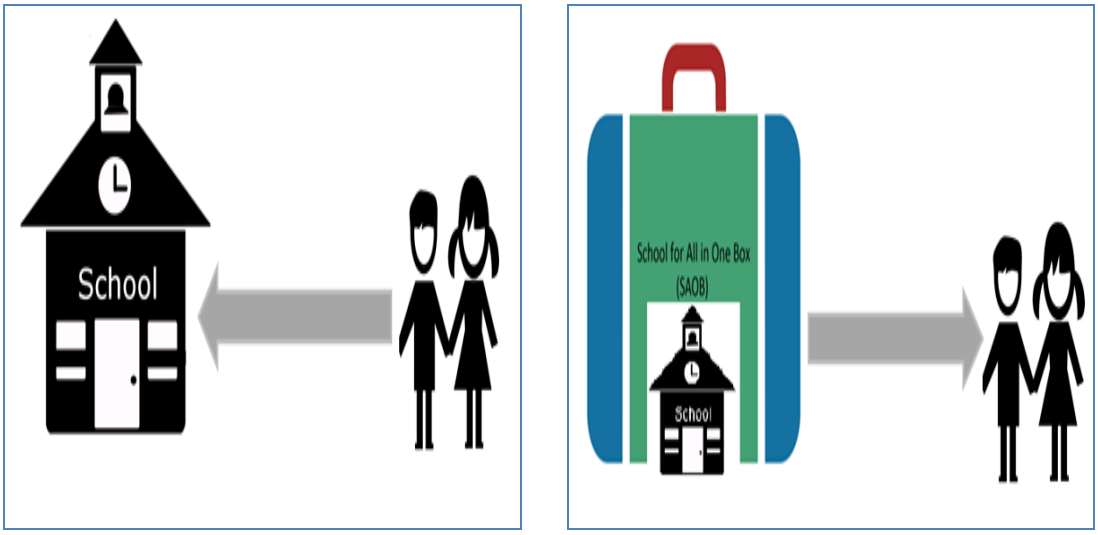


Fig. 10. SAOB acting as an intermediatory between BoP people and EaaS.

In traditional education system student needs to go to school for study but the proposed SAOB box will bring the school near to the students as shown in Figure 11. They will need not to go to school rather school will come to them to provide them education at any time.



(a) (b)

Fig. 11. (a) Students are going to school for getting education in the traditional educationl system. (b) SAOB will bring school near to the student for providing them education in the proposed system.

Existing EaaS is providing education to the higher class and middle class people whereas the SAOB will provide education to the BoP people as depicted in Figure 12. This SAOB box will reduce the illiteracy rate of the BoP populaton and will help them to get a better life

8. DISCUSSION

In section 5 several key challenges were listed and possible solutions to overcome those challenges are discussed below.

- **Public awareness:** This challenge can be addressed with proper campaign. Micro-finance institutions (MFI) officers can help in providing campaign for gaining public awareness as they have good relationships with the people of the village as mentioned in [16].

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(a) (b)

Fig. 12. (a) Existing EaaS providing education to the higher class and middle class people. (b) SAOB will provide education to BoP people.

- **Lack of technical people:** This challenge can be addressed with providing proper training.
- **Availability of strong internet connection:**To meet this challenge the EaaS will provide in two mode-i) online Eaas and ii) offline EaaS. People who are out of internet connection will provide offline EaaS with the help of educational CD/DVDs.
- **Lack of electricity:** Some changes need to bring to the proposed SAOB box to address this challenge. A small solar panel will add to the SAOB box and a battery system will include to store the electricity that is produced by the solar panel. This stored electricity will use to operate the electrical devices of the SAOB.
- **Financial challenge:** This challenge can be addressed by designing cost effective devices. For example we can use $100 dollar tablet as mentioned in [17]. Moreover, private sector-public sector partnerships to pilot projects is a strategy that has gained currency among Ministries of Education in developing countries. These partnerships take many forms,

including private sector grants with government counterpart contributions, donations of equipment and education-related content by corporations to state-run schools, and the provision of technical assistance for planning, management, and strengthening human resources at the grass roots level. Multilateral organizations and international aid agencies have also driven many of the most significant ICT in education efforts in the developing world.

- **Content developers:** In recent days lots of young people are available who have excellent skill in graphic designing, scriptwriting, audio and video editing, programming, web developing etc. Hence, educational contents can easily be developed with the help of them.

This box will also be cost effective. Let's consider the following points.

- For establishing a school there will need a building, benches, tables, chairs. This may cost at least 1 million. However, the cost for developing for each SAOB will be at most 0.3 million.
- Moreover for teaching their will need teachers. Government need to pay them individually a salary. In this system, there will need one skilled person to carry the box to the BoP people instead of more teachers. As a result, it will take comparatively less salary than that of needed for teachers for same purpose.

Therefore, this may conclude that the proposed SAOB will be feasible and will help the BoP people to get proper education with minimum cost, at any place and at any time.

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