

Allowing schools access to affordable computers: How schools can benefit from switching to inexpensive, cloud-based computing technologies

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Abstract

Nowadays schools own computer labs and laptop carts developed to be shared among a large number of students and this task requires buying desktop computers and other necessary equipment to create opportunities for them to achieve skills in basic computer programming, internet browsing, etc. Unfortunately, schools cannot afford expensive desktop computers, which require maintenance services and software updates and Chromebook can become a real life solution for that issue, because it does not require any expensive maintenance and it uses a Cloud-Based System for all the data that students have.

Keywords: Cloud computing, technology education, non-cloud-based computer systems, cloud- based computer.

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1. Introduction

Technology has long been an integral part of everyday life and basic computer skills are needed for nearly every aspect within our modern-day society. It falls upon schools to teach the necessary skills through using technology effectively in order to accomplish the tasks expected of the students; They must know how to type, run basic operations on computers, such as installing and uninstalling software, and how to use the internet safely to their greatest advantage.

In order for schools to be able to teach such skills, they have to purchase the necessary hardware and software that will be used by the students and pay to maintain the computers. This is an expensive endeavour for any school, especially those who either teach thousands of students within a district, or those schools that have a low annual budget and can only allow a small amount of resources for acquiring and maintaining desktop computers and laptops. Not only must they purchase these computers, but they are usually also shared among many students within the school, either in computer labs or on mobile laptop carts, which decreases their lifetime and increases the cost of maintenance. If one of the traditional computers does end up crashing to the point of data loss, any of the files located on it will be permanently gone, unless extremely expensive recovery options are pursued.

Low-cost alternatives to traditional desktop computers and laptops do exist and could alleviate many of the issues schools have to deal with. Lowering the cost of the equipment being purchased would allow for more equipment to be bought, reducing the number of students per computer, further reducing the cost of upkeep and replacement, when necessary. Also, in the event that a full system failure does occur, a cloud-based storage service would allow the same files to be accessed from any computer, requiring just a username and password. It would be an inexpensive system to purchase and maintain and could take advantage of near limitless cloud-based storage that would be accessible from any point with internet access.

2. Main Text

2.1. Current approaches to technology education

Currently, schools maintain computer labs and laptop carts designed to be shared among a large proportion of the student body. This requires the purchasing of desktop computers and the necessary peripherals, or laptops. Most schools nowadays opt for the use of laptops, as they are usually self-contained machines, so there is no need to purchase any peripherals. However, even the least expensive Microsoft-based laptops will cost around \$500 per computer (O'Donnell & Perry, 2013) yet, being the inexpensive version tends to mean they'll run more slowly, encounter more unexpected errors, and are not made from high-grade material that will endure the regular and shared use they will see in a school setting.

The increased demand for technology education means that nearly every school is expected to purchase and maintain computers that are accessible for the students to use, but generally schools do not have the funds necessary to supply an entire student body with quality machines that will always be available for use.

Generally, a school will purchase a number of machines to be shared amongst the student body. Even though machines are not being purchased for each student, or even enough for every four students to share one computer, a school can potentially spend thousands of dollars just acquiring the minimum they could possibly use.

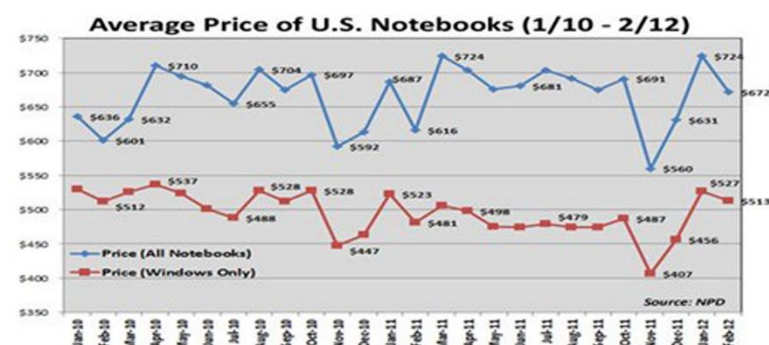


Figure 1. Average prices of laptops from January 2015 to February 2015

Figure 1 shows the average pricing of laptops from January 2015 through February 2015, indicating that the average price for a laptop computer is maintaining a price of about \$450-\$500. If a school bought only twenty laptops to share among its student body, then it could cost them upwards of \$9,000-\$10,000, which is a serious investment and does not take into consideration the cost of maintenance and replacement.

2.2. Challenges associated with using and maintaining traditional non-cloud-based computer systems at schools (Chrome Books, 2014);

2.2.1. Costs of non-cloud-based computer systems

One of the major reasons for shifting to a Cloud-Based Computer is cost. We can compare the costs by dividing them into several sections and showing the significant differences:

1. High hardware replacement costs

On average, it costs \$1042 per device every 3 years to deploy some traditional non-cloud-based systems at schools. The costs include individual computer prices and any associated hardware prices (server

2. High maintenance costs.

On average, schools spend \$342 per device every 3 years to maintain it. Costs include IT labour deployment and salaries. Time management of Non-Cloud Based Computer Systems: Time can be a serious factor that affects the repair and update times for traditional Non Cloud-Based Computers, which can lead to delays and downtime. For instance, there are several reasons for delays in school computer systems:

3. Downtime due to repairs and updates.

Every year there is a 1-hour downtime for a typical user of a traditional public school computer system.

4. Downtime due to older and not user-friendly technologies.

An average user (especially school teachers) has to spend more than 1.5 hours on training every year when using some traditional school computer systems.

5. Large older-generation computer systems tend to be slower.

There is a 7-hour boot/reboot time period per user per year associated with usage of traditional non-cloud-based computer systems in schools.

Security of Non-Cloud-Based Computer Systems:

Security is always one of the important indications of any technology and appropriate safety systems are mandatory. It is clear that Cloud-Based Computer Systems have several advantages over the traditional Non-Cloud-Based Computer Systems and they are as follows:

6. User data can be lost if not constantly backed up.

On average, there is at least one file lost due to application failure on traditional non-cloud-based systems in schools (Herrera, 2011).

7. Malware causes downtimes and results in additional costs.

The time and costs are already included in the above categories. In general, traditional PCs are more vulnerable to malware attacks as users have more freedom in terms of working with applications and files. Some cloud-based operating systems allow only approved, and thus safe, applications to be installed and constantly check the system's state. If suspicious activity is detected, the system can be restored to its last "verified" state as system states are constantly backed up to the cloud.

2.2.2. Flexibility of non-cloud-based computer systems

New inventions help students to access any of the school material without being at school, while traditional computer systems require students to be at computer labs. in the school. It shows that new cloud-based technology is very flexible and effective.

8. Traditional in-school computer systems cannot always allow after-hours student collaboration with the teachers.

Usage of laptops and tablets (or other portable devices) eliminates this problem even if the system is not cloud-based.

All of the above issues result in public school children losing opportunities to learn. Saved funds could improve the quality of education (like a decrease in the number of students per computer) and decreased downtime could result in more time spent on actual studying (Kendrick, 2015).

2.3. The solution: Inexpensive cloud-based computing

The days where it was necessary to contain all the information within the machine you are regularly using have passed. Cloud-based storage options allow a user to work fully online, rely on auto-saving technology in the event of a crash and mean that they are able to access the files and the information they need from anywhere that has an internet connection. The machines that drive such technology only have one main purpose, to run a browser that gives full access to the internet and run web-based applications.

Such a machine would require minimal processing power, which means that the technology inside requires very little space, increasing the space for the battery, which, in turn, allows for a longer battery life. Also, since the machine running the simplified operating system does not have to be powerful, the cost could be driven down by several hundred dollars, allowing for the purchase of more laptop computers or freeing up money for other educational programmes.

Also, since these machines run almost exclusively online, data recovery is no longer an expensive endeavour, but instead, only requires another computer through which to login. Another cost-benefit of such a system is that, due to their already inexpensive nature, the cost of repairs and parts replacement would be greatly reduced. According to Telefonica (Eadicicco, 2014) we can illustrate this technology as one main cloud of information:

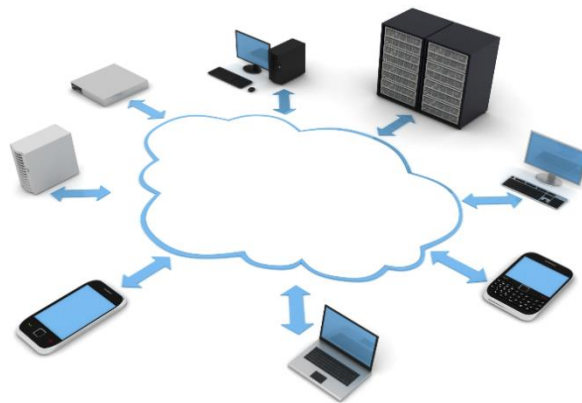


Figure 2. The use of cloud technology allows the access of online information from any linked device

Switching to an inexpensive cloud-based computer system would help educators in many ways:

- 1) Individual computer pricing is driven down by the inexpensive technology in use.
- 2) The same amount of funds would allow for the purchasing of more laptops, meaning one computer would be shared among fewer students, reducing the costs of upkeep.
- 3) Data recovery would no longer be necessary.
- 4) Teachers and Students would be able to collaborate outside of school hours, due to the nature of cloud-based technology.
- 5) Repairs, parts replacement and full laptop replacement would be much less expensive.
- 6) Licensing fees for software could be virtually eliminated by adopting free online alternatives.

- 7) Smaller schools would even be able to consider loaning such laptops to individual students for use throughout the school year, further increasing the educational benefits by allowing the student to work at home with this technology.

2.3.1 The Google Chromebook solution

With its inexpensive nature and cloud-based technology to store user data, Google Chromebook gives schools the opportunity to integrate much needed features within the classroom to help students learn how to accomplish tasks through the use of technology. Due to its inexpensive nature, Google Chromebooks would allow schools to afford a larger volume of technology, which would thus reduce the number of users per machine. Through this, the average lifetime would be increased as well. On average, the implementation of Chromebooks can save schools an average of over \$5,200 per device over three years. Moreover, according to Mr. Kendrick (Wallen, 2014) one of the main advantages of Chromebook is that it works faster than Mac OS or Windows platforms and can search for websites with the fastest approach because Chromebook's hardware is optimised for only one task.

Through its web-based management console, facilitators are able to manage easily and configure their classroom's set of Chromebooks. Undesirable websites and apps. can be blocked to account for a clean online learning environment. According to Business Insider, it is clear that Chromebooks are extremely safe and protected from any web attacks, viruses, etc., since Google always updates its software and encrypts all the data saved on a specific device (Donawan, 2015). Chromebooks are easy to maintain as no security patches or upgrades are required for the machines. Thus, they are essentially free from viruses or malware. With the Google Chromebook primarily designed to be used while connected to the internet, students are able to connect to the internet via integrated Wi-Fi connectivity or through the optional 3G wireless internet access (HP Chromebooks, 2014). Instead of relying on school networks, students are able to have constant connectivity to the internet through this on an online learning environment for both teachers and students.

There is not any other device that gives a faster speed than Chromebook for that price. According to TechRepublic [9], it has its own operational system called ChromeOS and it is a single platform orientated only to the internet. They imply that "A device featuring an Intel Celeron 2955U 1.4 GHz and 2 GB of RAM feels far more powerful than it should. And with a boot time of between four and 10 seconds — and instant-on from sleep — you'll lose no work to laggy machines." This is a very important aspect today where it will not be necessary to wait for a long boot-up time.

Synchronisation of all the data that students may have is very important, since there might be projects, documents, research, etc. that students can forget to save and losing them leads to serious consequences. Chromebook is better because it stores all the data that students have and moves it to a Cloud-Based System. According to Digital Trends [10], it is clear that "the obvious benefit of everything being saved on the Web is that you'll have access to it from any computer. Plus, if your Chromebook ever bites the dust, you won't have to worry about losing all your apps, documents, and settings."

3. Conclusion

There is a possible solution to the problems I mentioned before and one of the best ways to solve them is Google Chromebook, because it allows teachers and students to engage in real time collaboration on assignments and projects with their peers through a cloud-based data storage system. Through this, users would not have to worry about losing their data if a computer fails, as their work is automatically saved on to the cloud each time a document is edited. Moreover, they are very inexpensive and school administrations should be able to afford them for education purposes

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