*e*Learning: The Internet Platform and the Role of Satellites (VSATs)

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Abstract

There has been a tremendous growth and convergence in recent years of applications capability, telecommunications and the Internet. At the same time, costs of equipment and services have been dropping. This convergence has great implications for the future of distance learning, with large investments currently being made. The question remains, how to reach the students, audiences and constituencies effectively when they are dispersed over distances and regions, sometimes without access to phones or electricity, and to bring these significant opportunities to them. Very Small Aperture (Satellite) Terminals (VSATs) offer a solution.

The Internet Platform and Education

Perhaps it should be remembered from the start, that *books* would have once been considered an educational technology. Before the printing press, books were rare and expensive, and education was a limited privilege transmitted directly from teacher to student.

Yet today, the democratizing power of the book is ubiquitous and most of us would think it unextraordinary to have stacks of books in our offices or homes. By all accounts, a similar process is unfolding with respect to the Internet and its impact on education. With the acceleration of technology, this impact is likely to be felt, globally, over the course of the next ten years, as opposed to the hundreds it took for the printing press and books to have similar impact.

The Internet is clearly an emerging educational technology and an evolving platform for the educational process itself. In this regard, John Chambers, chairman and CEO of Cisco Corporation[1] has stated:

> The next big killer application for the Internet is going to be education. Education over the Internet is going to be so big it is going to make e-mail usage look like a rounding error . . . E-learning, . . . if done right, can provide faster learning, at lower costs, with more accountability, thereby enabling companies and schools to keep up with changes in the global economy . . . (Friedman 1999, 25)

With respect to education, discussing the Internet Platform (IP) is to distinguish it from the *content* or *curriculum* itself. As a platform in its current state of technological realization, the Internet can deliver a host of different types of content or curriculum materials. The current state of technological realization is, of course, different from the current state of actual implementation, which varies widely from place to place, region to region, and even within locales themselves.

The types of content that can be delivered on the Internet Platform include those shown in Table 1.

• Data	• Text
• Graphics	• Pictures – Images
• Voice – Recorded	• Voice – Live
• Audio (including Music)	• E-mail
• On-line Discussion – 'Chat Rooms'	• Video Pre-recorded (Voice on Demand)
• (live, ongoing, and/or recorded)	
• Video Conferencing (live, interactive)	• Video Multicasting (live, one-to-many, several to several, many to many)

Table 1 • Internet Content Types

To oversimplify, for purposes of clarity, in the traditional model, *education* is acquired by the *student* under the instruction/guidance of the *teacher* through the means of the *curriculum*, in the *classroom*, all under the organization of the *school* (primary and secondary school, university, college, corporate training organization, etc.). Both the school and the classroom are defined, in significant measure, as physical places where the education is organized and takes place. Figure 1 depicts the Internet as a channel for enriching curriculum resources in a traditional educational setting.

Perhaps one of the most ambitious examples of this use of the Internet in education is a programme in the State of New Jersey in the US, called "Access New Jersey". This programme is a public-private partnership between the State of New Jersey and the private sector, especially Verizon (formerly Bell Atlantic – the regional telephone company) and FVC.com, an Internet Video Service Provider. This programme has set as its benchmark to establish high-bandwidth Internet capabilities for all students, at all levels in all districts throughout the statewide educational system. This includes over 600 school districts and the involvement of 100,000 teachers. In addition, special centres are being set up for teacher assistance and

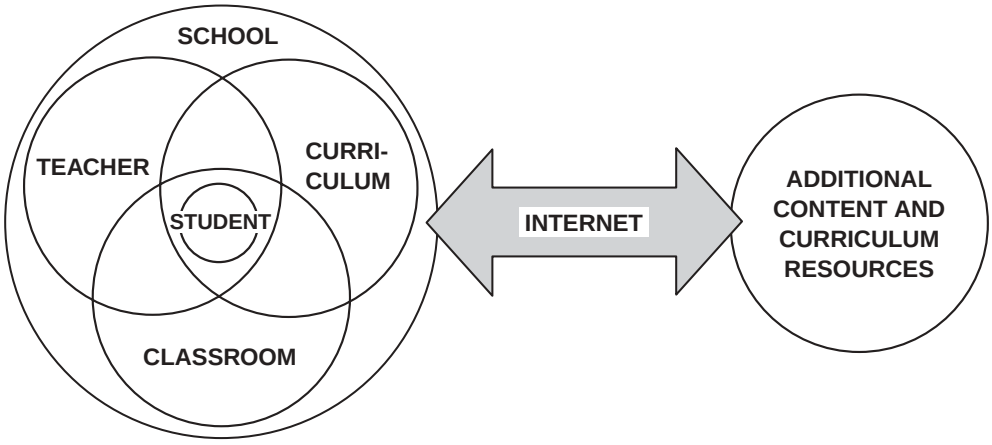

Figure 1 • Traditional Education – Internet Platform Augments Curriculum Resources and Richness

training (ETTC – Educational Technology Training Centres) and support centres for students who would not otherwise have access to the Internet outside of the classroom (ACE Centres – Access Collaboration and Equity).

The capabilities of the Internet go beyond provision of greater range and richness of resources for curriculum. Many functionalities and processes can be administered efficiently over the Internet. The ISP or Internet Service Provider is rapidly becoming a worldwide phenomenon. A specialized form of online functionality provider, known as the ASP, or Application Service Provider, is also a rapidly expanding business model. Some examples of consumer targeted ASPs include Hotmail (e-mail), eBay (online auctions) and Paytrust (online bill paying services). Commercial ASPs include Chemdex (online procurement center for the life sciences), Cephren (online construction management resource) and Webex (online meeting/conference services).

Many of the organizational capabilities usually associated with the functions of the school in the traditional education model can also be provided on the Internet in the ASP model. Figure 2 illustrates the Internet in the educational ASP model.

eCollege is a company that has partnered with over 190 universities, colleges and schools to create 'campus portals'. eCollege.com provides a variety of software and services that allow the outsourcing of a college's or university's online education platform, ranging from hosting the online campus, with registration and payment, faculty and student support, online student study groups, course supplements, support services, courses and curriculum development.[2] Not surprisingly, Rob Hemlick, eCollege's CEO and founder, shares sentiments similar to those of Cisco's Chambers: "The Internet will absolutely transform learning, making it faster, better and cheaper".[3]

As is obvious from the eCollege example, the Internet, as an educational technology, has the ability to integrate curriculum, academic organization and student-teacher interaction into a common platform, making it an ideal system for distance learning. Many traditional educational institutions are already in the process of embracing the Internet as their distance learning solution.

Figure 3 shows the model where the classroom becomes the student's place of Internet access. The classroom could be a formal one arranged

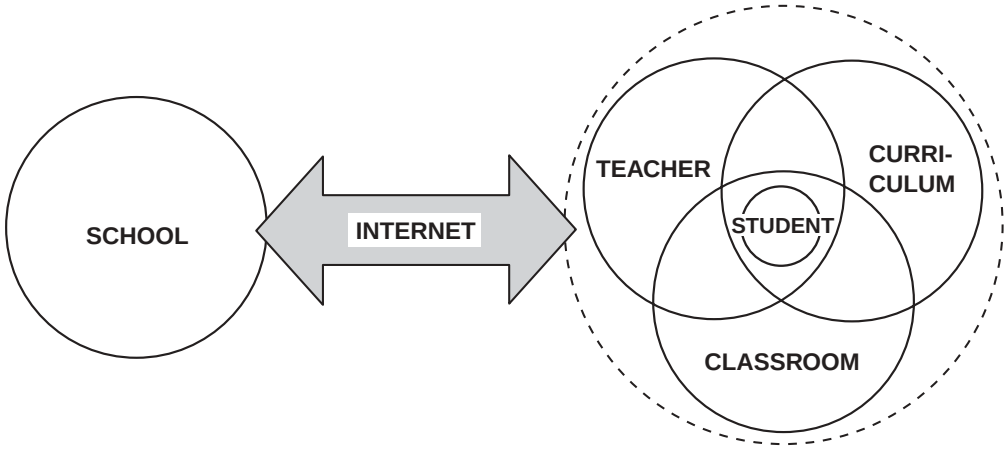

Figure 1 • Traditional Education – ASP Model Internet Augments the Organizational Capabilities of the School

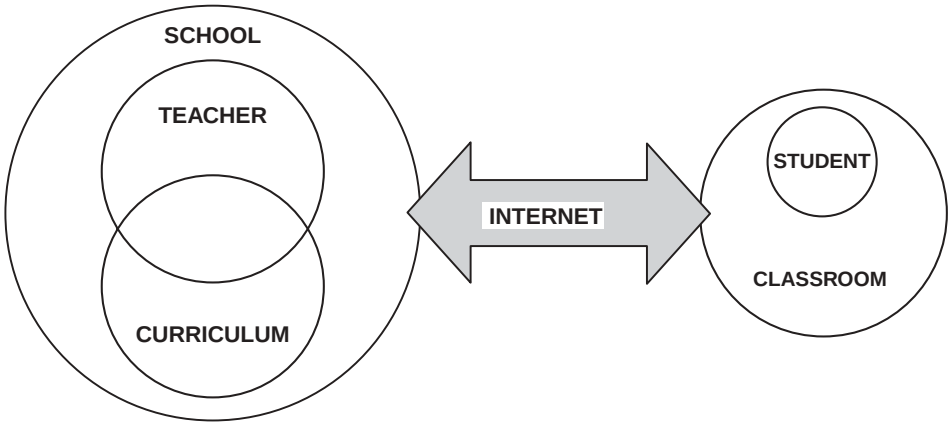

Figure 3 • Internet-Enabled Distance Learning from a Traditional Education Institution

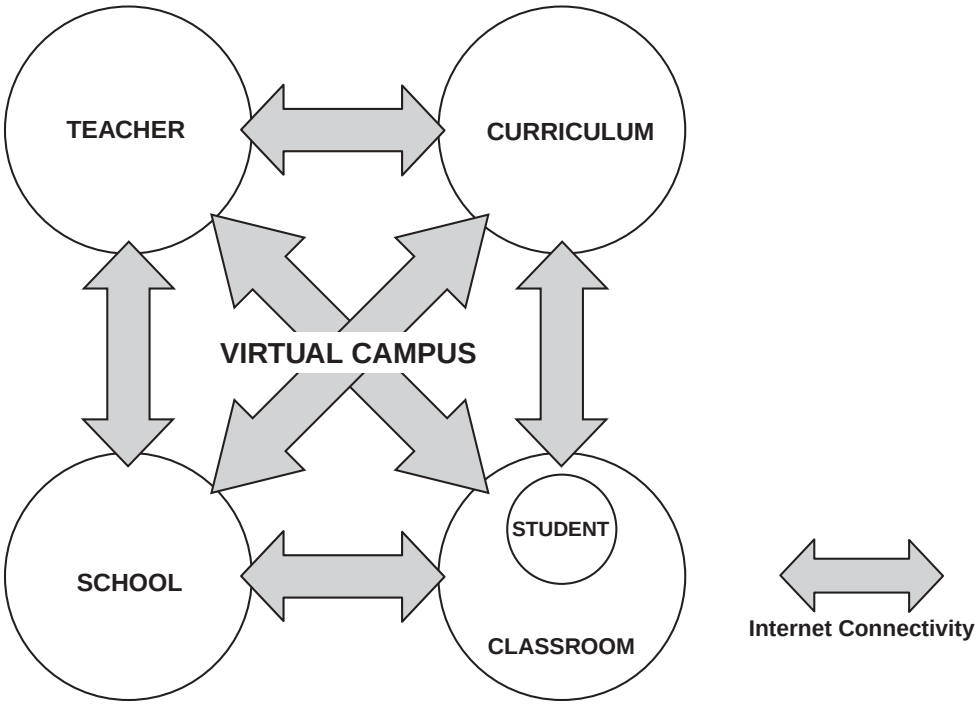

Figure 4 • The Virtual Campus – Internet-Enabled Distance Learning

by the school, or an intermediary facility such as a community center, or the student's home.

Ofek, the interactive distance learning center of Open University of Israel, is one of the earliest pioneers of using both Internet and satellites for distance learning. Ofek has established over 100 Internet study centres throughout Israel and 47 of them are equipped with interactive satellite links.

The capabilities of online student-teacher communication/interaction, as well as online access to curriculum and the organizational functions of the school, can all be linked together to create a completely virtual campus. A simplified virtual campus is shown in Figure 4. In actuality there are, of course, many students, many teachers and many curricula.

Virtual campuses are growing and taking on

many forms. Consider the following:

- OnlineLearning.net (OLN) is a company based in Los Angeles and affiliated there with the University of California Los Angeles. Recently, OLN offered an online course (course #F2058) hosted on a server in Toronto, Canada. The students 'attended' the course from their respective homes in Massachusetts, New Jersey, Washington, California and Hong Kong. The teachers 'taught' the course from their home base in New York (Confessore, 1999, 26). None of them met each other 'in the flesh' during the course.
- Training Net Inc. offers more than 100,000 online training courses from over 1,000 providers for a variety of professions (McGee, 1999, 395).
- Blackboard Inc. provides free build-it-yourself course creation software on the Web. It then hosts the courses that have been created so that anyone can sign up and pay tuition. Blackboard keeps 20 percent of tuition revenue, with the teachers getting the lion's share. Over 1,000 courses have been created in topics ranging from Infertility to Town Planning (Walker, 1999).
- The largest executive MBA programme in Canada is at Athabasca University, with enrolment almost five times greater than the next largest, with students 'attending' from Canada and twelve other countries. Its success has been attributed to its online infrastructure (Carrescia, 1999, 33).

The New ABCs

The preceding examples and illustrations of current educational implementations on an Internet platform all rely on and presume three key fundamentals, *access*, *bandwidth* and *connectivity*, the new ABCs. Access is simply the availability to a user or user population of a terminal or PC linked to the Internet. Bandwidth correlates to the speed and amount of data that can be transmitted over the Internet link to the terminal or PC. Connectivity (herein) is the capacity of the network platform accessing the Internet to respond to the user population, reliably and robustly; the integrity of the platform.

The Internet found fertile soil for rapid growth in the United States and other developed countries because of two preexisting conditions: (a) high levels of teledensity or access to the 'telephone' network of sufficient initial bandwidth and connectivity; and (b) widespread personal computer use to access the Internet. Many countries with developing economies do not have these preexisting combinations, and thus would have to make specific concerted efforts, at least from the point of view of establishing Internet Platforms for education. This may be done in conjunction with the existing telephone infrastructure. However, that existing structure is, in many cases, lacking varying degrees of access (not available in remote or rural areas), bandwidth (limited) and connectivity (not consistently reliable).

In recent years, several technological and economic trends have occurred that have the potential to ameliorate this situation to the degree they are given the opportunity to be implemented. While the term VSAT (Very Small Aperture Terminals[4]) is not yet a household word like Internet, VSATs are a robust and well-established technology, designed for *interactive* communications and IP over satellite networks, and with over a million units sold and installed

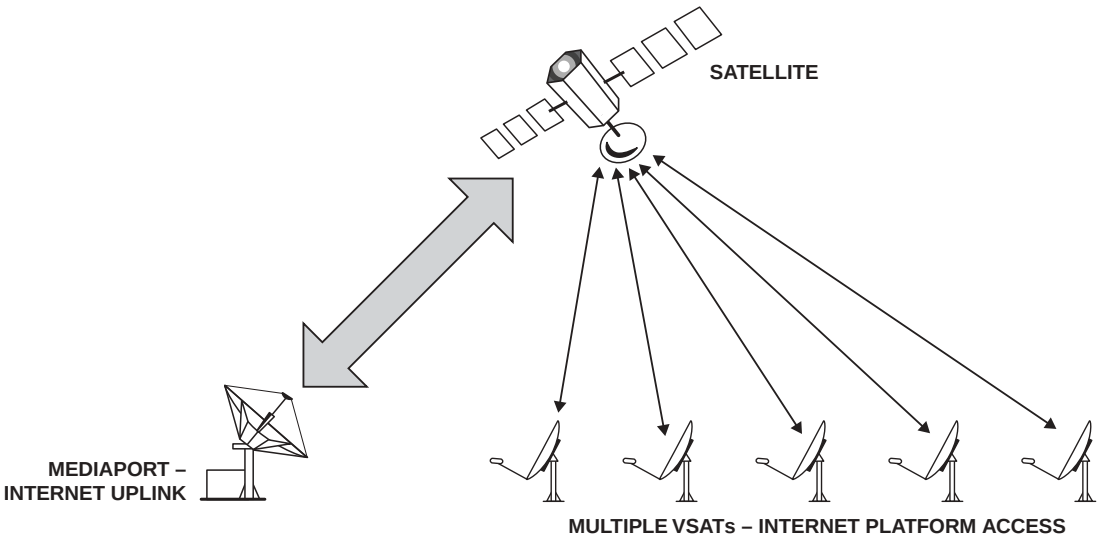

Figure 5 • VSAT Satellite-Internet Network

worldwide. Figure 5 illustrates a VSAT-IP network. Equally important is the fact that the price of VSATs has dropped by 90 percent (Hartshorn, 2000) over the last 20 years, while their capabilities and capacities have increased. Over the last several years, and 1999 in particular, VSAT based satellite networks are being used as a backbone for Internet services with the strongest growth in this area coming from the Latin American region.

VSATs are designed to address the ABC problem. They can create *access* over a wide region, are easily deployed, and can be set up in rural and remote areas (even run off solar cells) as easily as in cities. They have a wide range of *bandwidth* depending on their configuration, that can interactively transmit full-motion video as easily as voice, data, graphics, text, images, etc. They also provide a common robust platform for *connectivity*.

Connectivity was the driving force in the Caribbean for the creation of MEVA, the multi-country (and multi-language) mission-critical VSAT network that was formed to handle regional air traffic control (Shafer, 2000). Even more dramatically, connectivity is the issue behind the US Postal Service's decision to install more than 29,000 VSAT terminals to connect all of the post offices on one of the largest VSAT Internet networks in the world. This, despite the fact that the US has some of the best networks in the world. By establishing a single VSAT network, the post office will ensure high levels of connectivity throughout its system, and avoid problems that might be caused by plugging into a multiplicity of local networks.

VSAT-IP networks are an important solution to the ABC problem for both private and public sector education, one that is in the early stages of being implemented. Corporations such as Microsoft, AOL, Rite-Aid (drug store chain) and others are beginning to use VSAT networks for corporate training and education. Oakwood Homes, the largest retailer of manufactured housing in the US, began using VSAT network for training salespeople at its 350 retail centres and initially reaped cost savings in the seven-figure range.[5]

In the public sector, VSAT networks are being used for both traditional and new educational systems. Mentioned previously, Ofek in Israel has 47 VSATs as part of its learning network. The Indira Ghandi National Open University, which may claim to have the largest enrolment of any university in the world, is expanding its use

of VSATs. The University of the South Pacific has a history using satellites, and its current VSAT network links 12 countries spread over a 33 million square kilometre area. The World Bank has incubated two VSAT learning networks. The first, the African Virtual University, originates at a mediaport in the US and links to a VSAT in Africa where further distribution is over land lines. Future plans will locate the facilities in Africa and use VSATs to interlink them. The World Bank has also developed the Global Distance Learning Network, currently operating in 16 countries with extensive plans for expansion. In Mexico, International Datacasting is currently upgrading 20,000 schools for VSAT-IP capabilities (McConnell, 2000, 50).

New Issues for Educators and Policy Leaders

While the world moves towards an increasingly knowledge-based economy, the technological opportunities and changes afforded by the Internet Platform combined with the access, bandwidth and connectivity of interactive VSAT networks, create new sets of issues and challenges for far-thinking educators and educational policy leaders. The magnitude of the current challenge is forcefully stated by Chambers, quoting from elsewhere in the same interview:

> Unlike the industrial revolution when you had to be in the right country or city to participate, in this new era capital will flow to whichever countries and companies install the best Internet and educational capabilities. Governments and unions will be powerless to stop this capital flow, which will affect the global balance of economic power. Although the technology exists today, this revolution will take about ten years to be fully in place. But, it's coming next. (Friedman, 1999, 25)

While issues of curriculum design and the pedagogical nature of the teacher-student relationship are paramount concerns in the context of the new technology, other new dimensions are also emerging, including for example, the following:

- Curricula as intellectual property. Intellectual property rights (such as copyrights) are assets with economic value (for sales, royalties). When curricula are put on-line and made available through virtual campuses, ownership of the curricula poses new questions related to compensation.[6]
- Accreditation. While there are some 300 fully accredited major colleges and universities in the US offering degrees in 800 fields of study through distance education (Larsen, 1999, 74), there are now universities existing solely on line. Recently, Jones International University became the first, *fully accredited*, entirely online (no physical campus) virtual university (Confessore, 1999, 26).
- Obstacles to access, bandwidth and connectivity. Making virtual, distance, open and life-long learning truly available through the Internet Platform will require new strategies and partnerships to bring access, bandwidth and connectivity to the various target educational populations. It may also require the removal of barriers and other obstacles to making technology available. Many countries have telecommunications monopolies that may require involvement. The governments themselves may also create other obstacles. Unaware of the rapid change in VSAT costs and advanced capabilities, many governments still have antiquated licensing regulations, and, in some cases, prohibitive tariffs and customs for the importation of equipment. On a

regional level, there is a lack of coordination in licensing requirements so that a multi-country system (as might be both cost effective and appropriate in the Caribbean) would require drawn-out procedures. Europe has made great initial strides in this arena by creating an on-line 'one stop shopping' station for the European region (43 countries) VSAT licenses.[7]

- Education as a commercial marketplace. Perhaps more than ever before, education is viewed as a commercial opportunity. This will bring new capabilities, but may also cause traditional educators to question who will be setting the educational agenda and what the mandate will be. In the US, venture capital funds are already putting hundreds of millions of dollars into eLearning-based start-ups, where the educational market is considered to be $640 billion dollars (Walker, 1999). The US Department of Labor estimates that 75 percent of the 90 million person US workforce will need to be retrained in the next five years, in addition to the current annual corporate training expenditures of $60 billion.[8] The purpose of citing these statistics is not their direct relevance to other countries, but to illustrate the size of the economic and technological forces that are reshaping education across the board, and which changes will have extraordinary impacts elsewhere outside the US.
- Globalization. Virtual campuses and IP-mediated education has inherent transboundary characteristics. Unexus, Canada's first for-profit, degree-granting university residing solely on the Internet, will utilize professors, and seek students, from all over the world (Wahl, 1999, 171). Initially it has marketing and support offices in Canada, the US and Malaysia.

Within these challenges and on the cusp of these new technologies, there lies a vast array of possibilities for instilling added quality, richness, breadth and depth into the educational system, and at the same time, laying the foundation for bringing education to all, regardless of place, status or age.

Notes

1. At one point earlier this year Cisco was the world's largest corporation in terms of market capitalization. It is a manufacturer and provider of routers and networking products that power the Internet.
2. See www.ecollege.com.
3. Keynote Presentation, Telecon East, Washington, DC, March 2, 2000.
4. VSATs are probably more commonly thought of as 'small satellite dish antennas'. While they can be configured in many ways, a useful dividing concept is between *receive only* and *interactive or two-way*. It is the interactive VSATs that are of primary interest for Internet Platform educational applications.
5. "Savings With Satellites", *Communications News* 36, no. 11, November 1999, p. 55.
6. See G. Chambers, "Toward Shared Control of Distance Education," *Chronicle of Higher Education* 46, no. 13, November 19, 1999, pp. B8–B9; and D. Carnevale and J. Young, "Who Owns On-Line Courses? Colleges and Professors Start to Sort it Out," *Chronicle of Higher Education* 46, no. 17, December 17, 1999, pp. A45–A46.
7. See www.eto.dk.
8. "Savings With Satellites", p. 54.

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