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Education and the Internet

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Abstract

The growth of educational content in the Internet industry and the increasing use of the Internet in the educational system has been quite rapid in the last few years. This paper examines both the rise of for-profit Internet education start-ups and the use of the Internet to improve education in the existing offline educational system—in some sense, the supply and the demand for Internet education. While both have grown rapidly, key questions remain as to how effective either will be at enhancing educational productivity. The paper describes the state of the sector today and speculates where it will likely go over the next few years. Both sides of the market are likely to have significant effects on the productivity of the educational system only in limited areas, at least for the near term. These are likely to be things like corporate information technology training and M.B.A.-type executive education. Major productivity gains will need to wait for more comprehensive innovations in the sector. The total impact of the Internet on educational productivity in the near term is likely to remain rather modest.

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Section I: Introduction

Although the educational sector is not a business in the conventional sense, there has been tremendous interest in the role of the Internet and of electronic commerce as they relate to educational spending. This interest has taken two forms, the supply of education online through for-profit Internet start-ups and the demand for Internet technology and access on the part of non-profit public schools.

In 2000 educational spending in the U.S. will total about $772 billion, making it the second largest industry in the country at about 9% of GDP (Close and Hum, 2000). Although most of this spending is for non-profit and government run educational institutions, there has been a marked trend toward for-profit education in the last two decades and an increasing amount of distance education.

The sometimes awkward relationship between the Internet and education has grown rapidly in both the supply and demand directions. The goal of this paper is to examine the two distinct sides of the Internet-education market, emphasizing what has happened thus far and where it may be going. The overall theme of the paper is that the growth of the educational Internet has been rapid throughout the educational system but that, due to the nature of the product, the impact on educational productivity is likely to be fairly modest over the next several years except in certain niche areas such as IT training and executive education.

The paper proceeds in 5 sections, section II gives a brief overview of the benefits and the costs to learning online compared to conventional instruction. Section III then examines the for-profit supply side sector of the education on the Internet including the context and the likely productivity effects in three segments—general distance education,

corporate training, and executive and business education. Section IV examines the demand side of educational Internet technology in the existing school system documenting the rapid spread of Internet access in schools but also their lack of integration into the curriculum. Section V concludes.

Section II: Costs and Benefits of Online Education

A brief evaluation of the pros and cons of the Internet medium for education, akin to the analysis of eLearners (2000), makes it easier to understand the types of segments that are amenable to online education as well as the types of things that create problems.

The most obvious benefit from Internet education and training is the convenience. Students do not need to travel and can take the classes according to their own schedules (so called asynchronous learning) substantially reducing the opportunity cost of education and offering an appealing approach to introverted students or students not confident in their spoken language skills.

A second major benefit is that if done properly, Internet education is completely scalable with very low marginal cost. Education providers can potentially reach large audiences cheaply.

Third, the Internet, and computer training in general, is very good for automated types of tasks where it might be expensive to pay teachers to simply cover the same repetitive lessons over and over again. Albeit with considerable investment in course development, it is possible to create problem or simulation based content that can be a very effective means of teaching.

There most obvious downside of internet education is that at present it has very low bandwidth when compared even to other forms of distance learning such as video or CD-ROM, much less live instructors. This should give pause to anyone planning to start an online educational venture by putting lectures on the web.

Second, although the marginal replication cost of the content is low, the creation of Internet education content can be very costly and time consuming, limiting the profitability of creating customized instruction. The other side of the benefits of problem/simulation based learning is that if the school does not invest in the enhanced form of learning and instead just puts up regular reading materials online or streaming video of lectures, the retention is substantially worse than in conventional education.

Third, with existing technology, identity can be a problem since it is difficult to prevent cheating, dropping out, or other negative outcomes when the student is on the opposite side of a terminal.

Fourth, a large segment of the U.S. does not have a computer and has no Internet access, limiting the inherent market for the product. Further, appealing directly to customers online has proven an expensive proposition and many customers have shown little willingness to pay for things online.

Finally, although proponents claim that the Internet can enhance interactivity between students (Urdan and Weggan, 2000), in practice, interaction is minimal (Dalton et al., 2000). Subjects based primarily on discussion and interaction are not well suited to online instruction at this time. Even the need for graders, instructors and teaching assistants can get very expensive and make a course unwieldy.

Given these costs and benefits we can ask what segments of the education sector are most amenable to Internet education somewhat in the spirit of the De Figueiredo (2000) analysis of what will be successful online products. The most successful impact of the Internet in education is likely to be in areas where the students are working so they value time flexibility, where content does not need to be highly customized, where there would be travel involved in getting in-person instruction, where the students are computer literate, and so on.

Section II: Internet Education Ventures & the Effectiveness of Various Segments

A. Context

Throughout the twentieth century, when the returns to schooling have risen, typically the demand for education has risen significantly (see Goldin, 1999 for a discussion of the history of U.S. schooling). The 1980s and 1990s are no exception. The skilled worker wage premium has grown dramatically and this has fueled a rise in education overall and especially among distance and for-profit educational providers who cater to older students and to those whose instruction is more job oriented. Employers, recognizing the value of higher skilled employees have driven spending on corporate training to all-time highs. Using data from the Bureau of Labor Statistics, Wit Capital (1999) claims that the share of unskilled workers in the U.S. economy fell from 45 percent in 1991 to only 15 percent today. Regardless of the exact numbers, the shift toward higher educational demands on the job is clear.

Table 1 presents data on the size of various parts of the education sector (Urdan and Weggan, 2000). Most of the spending is on K-12 education but this is unlikely to

shift toward Internet spending in any serious way in the next five years. The same is true for childcare. This leaves the post-secondary education, continuing education and corporate training markets as the leading targets for Internet education start-ups. Over the next ten years, the number of people seeking post-secondary education is expected to rise by almost 2 million people and many of these will be looking at for-profit and distance education.

Within post-secondary education, table 2 illustrates that for profit companies already account for a large share of post-secondary institutions, almost half overall and more in the two-year and continuing education components (Close and Hum, 2000). Further, a growing number even of non-profits run distance education efforts. The information in U.S.D.O.E. (1999) suggests that in 1998, more than one third of 2 and 4 year post-secondary institutions offered some kind of distance education.

B. Segments

General Distance Education. The area with the most activity relating to online education has been distance education versions of the basic two or four year college experience. Many institutions have moved to using Internet technology to provide distance education. Although distance education has always been relatively small, the Internet appears to give these programs the ability to reach even wider audiences.

A surprisingly large number of colleges and universities in the U.S. have official distance education programs. The Department of Education report on distance learning (U.S.D.O.E., 1999b) indicates that in 1998 there were 1,680 colleges and universities with distance education programs and an additional 990 that planned to start one in the

next three years. In 1998 there were 1.36 million students enrolled in distance education programs, 1.08 million of which were in undergraduate courses. This was a 78 percent increase in enrollments since the previous report of 3 years ago (U.S.D.O.E., 1997). Carr (2000) cites the forecast of IDC that the number of distance education students will rise by more than 1 million over the next few years. Although growing quickly, it is worth noting that this is still only a very small fraction of the total student body in the U.S.

Simultaneous with, and probably contributing to this increase in distance education has been a major shift toward using the Internet in distance instruction. The share of distance education courses uses the Internet for some aspect of the course has risen from 22 percent in 1995 to more than 60 percent in 1998 so clearly the Internet is useful (U.S.D.O.E., 1999b).

One issue that all the Internet education start-ups must confront, however, is the limited pedagogical success of several types of distance education in recent years: video tape, television broadcast, and CD-ROM. Each of these was touted as a new way to deliver content to the educational consumer—a star teacher lecturing on a video tape would be superior to a mediocre teacher lecturing in person. Their success has only been moderate—distance education is still a small segment of the overall market. The Internet has even lower bandwidth than these technologies so its ability to supplant other methods may be limited. Indeed, the Department of Education survey indicates that while 60 percent of distance education courses use the Internet, half also rely on video tapes and more than half on video conferencing. Eighty two percent of say they intend to increase the amount of Internet instruction in their courses, 61 percent say they intend to increase

the amount of video-conferencing, as well. In this sense the Internet may be viewed as just another input into a typical distance learning course.

Further, there are some major difficulties with shifting to general distance education online. First, the evidence in Dalton et al. (2000) points out that reading retention from online material is about 30 percent lower than from books. While institutions could put in place problem and simulation based classes, to do so would be quite expensive so most have just been using the Internet as a way to post reading materials, problem sets and the like and, therefore, probably are not providing much improvement on existing courses.

Second, the lack of identity online inherently limits the ability of the product to move up the quality ladder. For the most part, the successful distance education firms are lower market educational or hybrid institutions—University of Northern Colorado, University of Phoenix, Capella University, Kaplan University, and so on. It will be difficult to get the kind of prestige held by institutions such as Yale and Harvard until one can be sure of who is turning in the work.

The dark side of the identity, question, as well, is that the types of students getting education at for-profit companies are noticeably higher risks than traditional students are and this threatens the accreditation process for the schools and various types of federal funding (both of which are affected by high student loan default rates and high dropout rates). The data in Close and Hum (2000) show that the student loan default rate among for profit schools postsecondary schools is almost double the national average at that education level. Their discussion also indicates that students at these for-profit schools sue the school over placement and education issues with disturbingly high frequency.

Third, creating the community aspect of a standard college environment is quite difficult online. To be sure, there are companies trying to do just that, such as Fathom.com, an alliance of the Smithsonian, the New York Public Library, the British Library, L.S.E. (see Kiernan, 2000) but the low bandwidth of the Internet and the inability of students to get together make this somewhat of a long-shot.

Finally, even as the Internet becomes highly useful in distance education, it is worth considering whether it will have much effect on educational productivity. According to most analyses, albeit most of it done before the Internet existed, distance education is, at best, equally effective as instructor-based and many clearly feel it is worse (see Phipps et al., 1998). There is little cost advantage, however, other than travel, to taking most of the distance education courses. The data in U.S.D.O.E. (1999b) indicates that 77 percent of the institutions with distance education programs charged the same tuition for those courses as for their conventional classes, 6 percent charged more and only 3 percent charged less (14 percent did not specify). Judged this way, the use of the Internet for general distance education probably costs about the same for tuition and slightly less counting travel but provides content that is at least somewhat inferior to conventional instruction. The total effect on productivity probably isn't very large. At best it is may dominate the distance education segment of the market but will likely have significant problems cutting into the market of conventional offline instruction.

Business Education. Business post-graduate education is one of the segments most in demand in the current educational environment and allows for some distinct differences from the problems of general distance learning discussed above.

First the buyer is typically the student's employer, limiting the customer acquisition costs and financial defaults and also making it easier to establish a reputation for quality (e.g., our courses have been used by IBM, Microsoft, and so on). Most of the students are busy, want to avoid taking time off from work, and currently have to travel to get this education from a traditional program. The data in U.S.D.O.E. (1999b) shows that of institutions offering any distance education, 55 percent of them offer business courses. This amounted to about 20 percent of all 2- and 4-year post-secondary institutions in the country so the current market seems ripe for an Internet approach. Frequently the demand for this type of education is to learn some basic knowledge area such as accounting rather than to get a degree.

Several Internet start-ups have targeted this segment, some run by offline business schools, some pure-play Internet firms that form alliances for content, and some where an online firm creates its own content. Pensare and UNEXT.com, for example, have each contracted with leading business schools to help provide content and then they create learning environments based on that content (Pensare has allied with Harvard Business School publishing, Fuqua, Wharton, and U.S.C., UNEXT with Stanford, Columbia, the University of Chicago, The London School of Economics, and Carnegie-Mellon). Both companies employ instructors to facilitate discussion and try to encourage "community" between the students on the site. UNEXT also intends to offer degree programs through its Cardean University brand. The two companies have signed up customers among major companies such as IBM, Fujitsu and Unysis, though most of the courses are in testing stages at this point. Multinational firms provide a particularly good place to

market the product since they often have English speaking potential students stationed far from offline business schools.

Estimates of the cost of taking an online course from Pensare are around $300 - $600 per student with discounts available based on volume (Urdan and Weggan, 2000). At this price, the courses are likely to cost less than half what a comparable unit would at an executive education center. Forbes estimates the UNEXT cost at 80 percent of a comparable instructor led M.B.A. class (Forbes, 2000). There do seem to be cost savings here, even separate from the travel expenses.

The goal in these programs is to create content that is explicitly problem and simulation based rather than just video lectures and online readings. This is likely to greatly improve the quality of these courses compared with standard distance education and, in some areas, may be better than conventional methods. According to Dalton et al. (2000), simulation based Internet education on accounting at Harvard Business School showed that training times were reduced by 50 percent and scores significantly improved relative to conventional instruction. If accurate, the Internet would stand to be a major productivity enhancement to the executive education market. As a result, though, each these courses can cost more than one million dollars to create (Forbes, 2000). The simulation/problem based approach is easier in fields that lend themselves to problems such as finance and accounting as opposed to softer subjects like organizational behavior or ethics.

One interesting competitor to these online executive programs is the new Fuqua (Duke) School of Business Global Executive Program. This hybrid program is taught with the same faculty as the regular M.B.A. program and much of the class is conducted

online. In addition to the online requirements, however, this program requires the students to spend some time in residence and the tuition is more than a traditional M.B.A. This residence requirement gives the Duke program the potential to create community and raise the perceived quality of the program but it also ensures that the model is not scalable. It will be interesting to see if they will have sufficient incentive to develop the expensive simulation/problem based learning environments needed for good online instruction when they cannot resell the content to tens of thousands of students at a low marginal cost. My impression is that hybrid classroom/Internet models will have difficulty becoming widespread for this reason.

Corporate IT Training. One of the other clear markets for Internet education is for teaching computer related training to corporations. The spending on corporate training in 1999 exceeded $62 billion and IT training accounted for about 50 percent of that total (Training Magazine, 1999). This area has many of the same advantages as executive education as relates to the Internet and there is the further plus that the workers and the subject matter are, by definition, closely related to computer technology. Some have gone so far as to argue that IT workers are *more* comfortable with computer based training than they are with human beings!

There is a fair amount of anecdotal evidence about the use of Internet based IT training at high technology firms such as Cisco and Sun but the data in Urdan and Weggen (2000) suggests that in 1999 Internet delivered training was only about 8 percent of corporate of IT training while instructor led training still accounted for more than 70 percent, even of computer training (Training Magazine, 1999).

Data on effectiveness is difficult to come by but fragmentary evidence suggests that IT training online may represent a productivity improvement. In interviews with training managers at major companies, Dalton et al. (2000) report that two-thirds of respondents report that the main benefit they derive from online training is cost savings, albeit largely through reduced travel budgets. Urdan and Weggen (2000) claim savings of 50 to 70 percent compared to instructor-led training.

Outside of the IT area, though, Internet training is unlikely to be as successful. For whatever reason, the training managers report drop out rates from online programs is as high as 80 percent (Dalton, et al., 2000). These courses are apparently much less effective, perhaps because the nature of the content easily adapted online.

One firm that has succeeded in this corporate IT training marketplace has been DigitalThink. Their model is to provide computer training 100 percent web delivered for between $195 and $450 for a 20 hour course. These prices are significantly lower than a typical instructor led course. They have more than 200 courses on subjects like C++ programming, MS Office applications, and the like. Since 1997 they have delivered 150,000 training courses. Their customers have included Cisco, Motorola, Intel, and many other companies.

While this has been a successful venture, the total impact of the Internet on training quality outside of IT may be quite small. Urdan and Weggan (2000) estimate that spending on corporate training online will rise from about $550 million in 1998 to be about $11 billion in 2003. This would be an extremely successful spread but would likely not have a dramatic effect on the overall productivity of training courses since this would still be only about 10-15 percent of the corporate training bill. Likely it would

involve quite productive improvements to IT training, perhaps even coming to dominate that segment, but probably much less in other types of training.

Section III: The Internet in Public Schools

A. Context

Although rather far removed from the high-flying world of Internet education start-ups, thousands of public and private schools around the country are clamoring to increase the amount of Internet and computer technology in the classroom. This is the demand side of the Internet education market and it has become a major political issue in the last five years with President Clinton and both presidential candidates pledging their support for various initiatives to increase the use of technology in the schools. Much of this push has been in the context of the digital divide between so called information haves and have-nots, often similar to splits along income and racial lines (see Goolsbee, 2000; Walsh et al., 2000). In 1994, Clinton called for all public schools to be wired by 2000 and proposed a series of programs to help make that happen.

The most important federal program has been the Universal E-Rate program, passed in 1996 and operated through the FCC. This program established larger subsidies of 20-90 percent for school and library access to the Internet with the largest subsidies being reserved for low-income schools. Spending on this subsidy has totaled more than $2 billion per year, funded by a regulatory charge on long distance (and not without controversy—see the critique of the program in Hausman, 1998 of the deadweight costs of the tax involved). Compared to the total computer spending in public schools for 1999 of $3.3 billion (including hardware, software, training, networking, service, etc.), this has

been a very large program, indeed (Lake, 2000). It is worth considering its impact on schools.

B. Effectiveness

What is generally not understood by the public is how far these programs have already gone toward wiring schools. The share of schools with access to the Internet has grown dramatically since 1994. Tables 3 and 4 present data compiled by the National Center for Education Statistics. Table 3 gives the share of schools with Internet access. Table 4 gives the share of instructional rooms with Internet access. In 1994, about one third of schools had Internet access and only 3 percent of instructional rooms had such access. By 1999, 95 percent of schools had Internet access and the share of instructional rooms with access had increased more than 20 times to 63 percent. In this sense, the wiring of schools is almost complete.

The data even show that among schools with more than half the students eligible for free or subsidized school lunches (i.e., low income locations), more than 90 percent of the schools have Internet access, though there is a noticeably smaller share of instructional rooms with access to the Internet among the very poorest schools.

Given that success, however, it is worth wondering how this spending on technology will affect educational outcomes. Measured as an enhancement to the productivity of the educational system, the Internet may have much more subtle impacts. It is probably unrealistic to expect that putting Internet access in an otherwise bad school will make the instruction significantly better, especially if the Internet is not integrated into the curriculum. Although almost two-thirds of teachers have used computers or the

Internet for classroom instruction but the share using it for things beyond the simplest simple computer applications (i.e., who actually use computers or the Internet for drills, projects, or multimedia presentations, etc.) is likely to be less than half that rate (see the data in U.S.D.O.E., 2000b). The estimates of Hawkes (1998) using data in 1995 indicate that installing a school technology plan (i.e. computers and the Internet) cost $180 - $501 per student and required ongoing spending of $40 to $105 per student to maintain. Once the E-Rate program ends, it will be interesting to see whether schools will maintain their connections to the Internet.

Questions also remain about the qualifications of teachers to instruct kids about the use of computers. In a survey of teachers done by the Department of Education (U.S.D.O.E., 2000b) only one third of teachers reported that they were well prepared or very well prepared to use computers and the Internet. This share is notably lower for teachers with 10 or more years of experience. According to another recent study, most teachers are "novice or completely inexperienced" (Clarkson, 2000). In many locations, and especially in high schools, it is hard to imagine that the teachers know more about the Internet than the students already know themselves.

The next wave of Internet education investment will need to be in the area of training teachers and incorporating technology into the curriculum. These investments may have larger educational payoffs but may be slow in spreading. Without such training, the investments in Internet access are unlikely to pay major dividends for school productivity.

It would be easy to design experiments to test for the impact of Internet and computer access on test scores or academic performance. In fact, the technology

planning handbook put out by the Department of Education (U.S.D.O.E., 1999a) emphasizes that evaluation should be an important part of a technology plan, but in most places, it is an afterthought. Even without experiments, simply making such data available to researchers would allow for econometric tests. Given that there has been little direct work on the impact of the computer investments of the 1980s and 1990s on school performance, it may be a pipe dream to think that such analyses will happen for the impact of the Internet.

As a first pass, given that school spending generally has little apparent impact on school outcomes, it may be hard to imagine spending on the Internet doing much better (see Hanushek, 1996). But it might, especially if it increases something as fundamental as a student's motivation to come to school. This is also not to say that the productivity effect is zero. Certainly the Internet has enabled access to some resources that students might not otherwise have had. There are now numerous online libraries millions of books that small school libraries could not carry. For a student wanting to do research or read such materials, access to the Internet at school could be a boon, although how many students actually use such resources is unknown.

Other small productivity enhancements include things like state and federal clearing houses of information such as the Educational Resources Information Center (ERIC). This is a network that catalogs, summarizes, and provides access to education information. The data base and ERIC document collections are housed in about 3,000 locations worldwide, including most major public and university library systems. ERIC produces a variety of publications and provides user assistance, including things like AskERIC, an electronic question answering service for teachers on the Internet, 16

subject-specific Clearinghouses, and the National Parent Information Network giving information to parents of school children. Again, the capabilities may be several years ahead of consumer usage at this point but there are at least some conceivable benefits.

There are also, potentially, the back office functions for educational institutions including the handling of student records, transfers of transcripts, and the like. As in the case of medical records, privacy issues may prevent being too comprehensive in the conversion at the moment but there are technologies that may develop on this front in the coming years that enable schools to exploit this productivity enhancer more thoroughly (see Zittrain, 2000).

IV. Conclusion

The educational sector is massive, regulated and bureaucratic. Recent years have seen an explosion of interest in for-profit online educational ventures as well as the use of the Internet in public schools around the country. While there has been a great deal of activity, the impact of the Internet on educational productivity is likely to remain quite modest for the next several years except in areas particularly amenable to the Internet. These are likely to be areas like executive education in areas like finance and corporate IT training. As a replacement for a typical college or junior college experience, the Internet is still a very far away.

On the demand side, the spread of Internet access to public schools in the last five years has been quite dramatic and is now close to 100 percent. This is true in rural and urban areas. This is quite an accomplishment. Its impact on school performance is likely to be modest, however because the teachers are generally not prepared to teach students

Internet or computer skills and the Internet has not been integrated well into the curriculum. It will be interesting to see if investment in information technology in poor quality schools will have a higher rate of return (in educational terms) than other types of spending.

On both the for-profit supply side and the public school demand side, one gets the sense that fifteen years from now, the answers could be very different than they will be five years from now. In the near future, the Internet appears destined to be used more and more but not yet to have the potentially major impact that it could have in other sectors of the economy.

Looking to the longer-term, the impact might be substantially greater, though obviously much harder to quantify. The most promising might be the diffusion of best-practice simulation type training from private industry back down into the classroom, in either vocational or standard classrooms. In the long-run, given sufficient training or software development, teachers might be able to access learning programs specially designed for certain subsets of students who have a difficult time in the typical classroom or whose interests are more specialized than a small rural school can afford. At that point, the productivity gains to the Internet are likely to spread throughout the education sector and raise educational productivity more generally rather than just in certain niches. In some ways, that is the challenge that education poses for the Internet in the next twenty years.

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Table 1: Size of Educational Sector and Components in 2000

Total Education and Training Market	$772 Billion
Childcare	$40 Billion
K-12 Education	$386 Billion
Postsecondary Education	$268 Billion
Continuing Education	$12 Billion
Corporate Training	$66 Billion

Source: Urdan and Weggan (2000)

Table 2: Share of For-Profit Institutions Among Postsecondary Schools

Profit Status	All Post-secondary	4-Year	2-Year	Less Than 2-Year
For-Profit	48	8	34	86
Private	15	22	21	7
Public	36	70	45	7

Source: Close and Hum (2000)

Table 3: Share of Public Schools with Internet Access

	1994	1996	1998	1999
All Public Schools	35	65	89	95
Elementary	30	61	88	94
Secondary	49	77	94	98
By Share of Students Eligible for free or reduced price lunch				
0 -10 percent	40	78	87	94
11 to 30 percent	39	72	94	96
31 to 49 percent	33	62	94	98
50 to 70 percent	31	53	88	96
70 - 100 percent	19	53	80	90

Source: National Center For Education Statistics (2000)

Table 4: Share of Public School Instructional Rooms with Internet Access

	1994	1996	1998	1999
All Public Schools	3	14	51	63
Elementary	3	13	51	61
Secondary	4	16	52	67
By Share of Students Eligible for free or reduced price lunch				
0 -10 percent	4	18	62	74
11 to 30 percent	4	18	53	71
31 to 49 percent	2	12	61	68
50 to 70 percent	4	12	50	62
70 - 100 percent	2	5	49	39

Source: National Center For Education Statistics (2000)