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High Speed Internet Access Could Save Business \$Billions

According to an analysis by the Beacon Hill Institute, high speed Internet access can potentially save U.S. businesses \$11 billion annually by decreasing the amount of time spent by employees downloading files from the Internet. This is a conservative estimate insofar as it is based on lower-bound estimates of the fraction of businesses still using dial-up modems and of the amount of time spent downloading files each day by a typical worker.

High-speed options such as a Digital Subscriber Line (DSL) or T-1 Line are emerging as efficient alternatives to conventional dial-up modems for accessing the Internet. This fast-growing technology offers small businesses an opportunity to take advantage of dynamically-generated content such as videoconferencing, distance learning, and audio streaming.

To be sure, the speed of an Internet connection and of the transfer of files over that connection depends on a variety of conditions and variables including content management, network administration and Internet traffic. DSL and T-1 lines, however, can improve download and upload time — leading to an improvement in a small firm's productivity. And while its up-front costs are more expensive (a special modem and PC-Ethernet cards are required), DSL operates on current copper POTS (Plain Old Telephone Service) lines without disrupting voice telephone service. T-1 Lines, on the other hand, can be integrated to serve both voice and data applications for businesses. As such, both DSL and T-1 Lines have several advantages over dial-up service, including choices of several offerings with different upload and download speeds as well as cost efficiency.

Dial-up Modems versus High Speed Access

Using comparative data on download speeds and making reasonable assumptions about employee compensation, we are able to compare the cost of using dial-up modems versus DSL modems, ISDN and T-1 Lines.¹ In Tables 1—3, we calculate the cost of downloading three files of different sizes for three levels of employee compensation. This enables us to calculate the total cost savings, from the use of DSL, ISDN and T-1 Lines, relative to downloading with the use of a modem. These savings are presented in Table 4.

In order to interpret the tables, consider a download of a 2.5 MB file. It will take about 12 minutes to accomplish this task using a 28.8K modem. For an employee who receives compensation of \$20 per hour, the labor cost of this download is \$4.00. A DSL (384 KBPS) modem, on the other hand, requires only 52 seconds, costing 29¢ if performed by the same worker. Using a T-1 line at 1.5mb

¹ See "How Fast?" <http://www.everythingsdsl.com/howfast.html>.

requires even less time (13 seconds) and 7¢ in labor costs (see Table 1). The cost saving per download from using DSL is the difference between these two amounts, or \$3.71 (see Table 4).

About 25.46 million American workers go on-line at least once per day. The approximate on-line time per worker is one hour.² Given that small firms typically use dial-up modems, rather than high speed Internet access options, we estimate that as many as 11.65 million workers use dial-up modems.³

If these workers switched to DSL (384KPS) or T-1 (1.5mb), the time saved per worker who goes on line would be at least .9278 hours per day — a reduction of 92.78% in download time. The annual gross national savings for firms that pay a worker, on the average, \$10 per hour to download from the Internet would then be \$26.481 billion.⁴ At \$20 per hour per worker, the savings would be \$52.961 billion.

If the average wage is \$10 per hour and if only half of all Internet-using small firms now use modems, the gross national savings from the switch to high speed access options would still be a substantial \$13.240 billion annually. If we assume that the same workers spend only 30 minutes a day downloading files (out of an hour on line), the gross national savings from the switch to DSL or T-1 would be at least \$6.620 billion annually.

In order to compute the net savings from the switch to high speed access options, it is necessary to take access costs into consideration. We estimate these costs to be \$510 per annum (consisting of \$150 for equipment plus \$30 per month for access). Given that there are 12.582 million small firms, of which 70% have internet access, there are 8.807 million firms that could potentially incur these access costs. Multiplying 8.807 million by \$510 we get national annual access costs of \$4.492 billion. Subtracting from gross costs, the net annual savings is \$21.989 billion, given labor cost of \$10 per hour. The savings is \$48.469 billion or \$74.950 billion for labor costs of \$20 or \$30 per hour, respectively. Table 5, column 1 provides the derivation of these estimates.

Table 5, column 2 provides the same derivation for the same group of workers, but on the assumption that only 50% of small firms use dial-up modems. The estimated savings is \$10.994 billion, given labor costs of \$10 per hour. Table 5, column 3 provides the derivation on the twin assumptions that only 50% of small firms use dial-up modems *and* that the download time per worker is 1/2 hour per day. At \$10 per hour, the net savings falls, as shown, to \$4.374 billion.

A realistic and conservative estimate of the net saving is \$10.994 billion a year, as shown in the second last row of column 3. We get this estimate if we assume that workers earn \$20 per hour, that 50% of small firms have dial-up modems and that average download time is 1/2 hour per day.

² See Pew Internet Project, Wired Workers. <http://www.pewinternet.org/reports/toc.asp?Report=20>.

³ We assume that all large firms (defined to have 100 or more employees) have Internet access that utilizes high speed technology (see Table 5) and that 70% of small firms (with fewer than 100 employees) have Internet access. (See Dun and Bradstreet's 19th Annual Small Business Survey, <http://www.dnb.com/newsview/0500news8.htm>.) According to the U.S. Census (*Statistical Abstract of the United States*: 1999, Table 876), there are 102.1 million workers in the U.S., of which 58.8 million work for small firms. We assume the number of workers at these firms who are without access to be 16.76m $(=(1-70\%) \times 58.8m)$. Therefore, the number of employees in firms with Internet access is 85.44 m $(=102.2m-16.76m)$. We estimate that 29.8% $(=25.46m/85.44m)$ of employees in small firms go on line daily. Given that 39.09m $(=58.8m \times 70\%)$ employees in small firms have Internet access, we conclude that 11.65 million $(=29.8\% \times 39.09m)$, employees of small firms go on line daily.

⁴ Suppose workers make \$10 per hour. Gross national savings is \$26.481 billion $(= 245 \text{ days} \times .9278 \text{ hours per day of time saved} \times \$10 \text{ per hour} \times 11.65 \text{ million on line workers})$.

Considering that this estimate is at the lower end of our range, it is important to recognize that the actual amount might be far larger.

Table 1: Cost of Downloading a 2.5 MB file				
(approximately 25 pages of Internet text and graphics)				
Cost when employee hourly wage is:				
	Time*	\$10	\$20	\$30
Modem (28.8KBPS)	12 minutes	\$2.00	\$4.00	\$6.00
ISDN (128 KBPS)	2.5 minutes	0.42	0.83	1.25
DSL (384 KBPS)	52 seconds	0.14	0.29	0.43
T-1 (1.5 MBPS)	13 seconds	0.04	0.07	0.11

Table 2: Cost of Downloading an 8 MB file				
(approximately equal to a 20-second video)				
Cost when employee hourly wage is:				
	Time*	\$10	\$20	\$30
Modem (28.8KBPS)	37 minutes	\$6.17	\$12.33	\$18.50
ISDN (128 KBPS)	8.5 minutes	1.42	2.83	4.25
DSL (384 KBPS)	2.75 minutes	0.46	0.92	1.38
T-1 (1.5 MBPS)	43 seconds	0.12	0.24	0.36

Table 3: Cost of Downloading a 25 MB file				
(approximately equal to the entirety of Netscape 4.0 or Explorer 4.0 software)				
Cost when employee hourly wage is:				
	Time*	\$10	\$20	\$30
Modem (28.8KBPS)	120 minutes	\$20.00	\$40.00	\$60.00
ISDN (128 KBPS)	26 minutes	4.33	8.67	13.00
DSL (384 KBPS)	8.66 minutes	1.44	2.89	4.33
T-1 (1.5 MBPS)	2.2 minutes	0.37	0.73	1.10

Table 4: Cost Savings from using High Speed Access Options				
Savings when employee hourly wage is:				
	Using High Speed	\$10	\$20	\$30
2.5 MB	DSL (384)	\$1.86	\$3.71	\$5.57
	T-1 (1.5MB)	1.96	3.93	5.89
8 MB	DSL (384)	5.71	11.42	17.13
	T-1 (1.5MB)	6.05	12.09	18.14
25 MB	DSL (384)	18.56	37.11	55.67
	T-1 (1.5MB)	19.63	39.27	58.90

*Source: everything dsl <<http://www.everythingsdsl.com/howfast.html>>

Table 5 - Calculating the benefits of shifting to High Speed Access^a	(1)	(2)	(3)
	100% dial-up use	50% dial-up use	50% dial-up use limited (only 30 minutes for downloading)
Workers who go on line at least once daily (millions)	25.46	25.46	25.46
Total employees, 1996 (millions)	102.20	102.20	102.20
Download time per worker, hrs/day	1	1	0.50
Employees in small (<100 workers) firms (millions)	55.85	55.85	55.85
Small firms with Internet access	70.00%	70.00%	70.00%
Of which: with Internet access using modem	100.00%	50.00%	50.00%
Employees in small firms w/o Internet access (millions)	16.76	16.76	16.76
Employees in firms w/ Internet access	85.44	85.44	85.44
Employees w/ access to Internet who go on line daily	29.80%	29.80%	29.80%
Employees in small firms with Internet access (millions)	39.10	39.10	39.10
Employees of small firms who go on line daily (millions)	11.65	11.65	11.65
Reduction in time spent connected (12 minute or 720 second file dial-up now takes 52 seconds under DSL)	92.78%	92.78%	92.78%
Time saved per worker per day, DSL .384 over modem, hrs	0.928	0.928	0.464
Days worked per year	245	245	245
Gross savings per year at \$10/hour (\$millions)	26,481	13,240	6,620
Gross savings per year at \$20/hour (\$millions)	52,961	26,481	13,240
Gross savings per year at \$30/hour (\$millions)	79,442	39,721	19,860
Small firms (millions)	12.582	12.582	12.582
Small firms with Internet access, using modems (millions)	8.807	4.404	4.404
Cost of access, \$150 per annum for equipment, \$30/mth for access (\$)	510	510	510
Net savings per year at \$10/hour (\$millions)	21,989	10,994	4,374
Net savings per year at \$20/hour (\$millions)	48,469	24,235	10,994
Net savings per year at \$30/hour (\$millions)	74,950	37,475	17,615

^aSee footnotes for sources of data.