

## Week 1: Internet – Definition, History, Usage

### 1. What this class will do

A study of the *economic* issues surrounding the internet; how it affects individual firms in the market-place, both IT intensive as well as those in traditional industries; how it affects competition amongst firms; what is the nature of such competition; how does it affect the entry of new firms and new technologies; what effect does it have on intermediaries and retailers; how global does the market place become; what factors make success more likely in the global market place, etc.

In parallel – look at a variety of case studies of internet firms to illustrate the economic issues. Some well-known firms, some sectors.

### 2. What this class will not do

Will not discuss - *technology* of the internet in any detail nor technological changes; a *marketing* approach to e-commerce (will not help you start an e-commerce firm); the *sociology* of the internet (newsgroups, chat-groups, etc.). Approach will be that of (intermediate) microeconomic analysis, rather than a sloganeering or journalistic one.

### 3. Caveats

Virgin territory – internet is barely 25 years old, the WWW is 9 years old (for all practical purposes), the economics of the internet is still in neo-natal ICU. Course is taught at less than half-dozen univs. (?) (e.g., a Yahoo search does not bring up any class listing or syllabus). So there is no textbook, nor accepted body of thought. But given the importance of the sector (in 4 years as big as automobiles?) and the excitement of participating in the emergence of the next big technology of mankind, what is a little improvisation?!

### 4. Internet – structure

*Network of computers joined together by a common set of standards and interface compatibility.* Two primary parts – email and world wide web. Two principal sets of structural issues – technological and economic/business.

#### Technological structure

*Technological structure* of internet (my understanding!): set of computers in a hierarchy linked via phone lines and switches (aka routers). For example, when message sent out from my machine it goes to Columbia server. Latter knows from header address which “pipeline” to send message down. Message may travel down a few more (?) cable or phone links before it arrives at destination server. At each level, header tells routers where to direct message.

Messages sent in *packets*. Analogy with postal service (and different from telephone call where there is a dedicated line for every person to person connection). Each router can be thought of as a post office; local to regional to national to regional to local, etc. Huge volume means that packets can be aggregated quickly in a matter of seconds (but recall vsnl in India).

World Wide Web adds *referencing capability* – any file on any computer anywhere in the world can point unidirectionally to any other file on any other computer in the world (provided it is written in HTML). Again, there is a description (“header” – aka URL) that pinpoints the location of the referred file.

Compatibility – for system to function there needs to be a uniform set of rules, terminology, programming language within the network. This uniform set of rules called a *protocol* – TCP/IP for internet as a whole and specifically, HTTP for WWW. The power of internet stems in large part from the flexibility and Catholicism of the protocols; only the network protocol is uniform, but each node of the network left free to design its own specifications, own platform (IBM, Apple), own programming language, own intranet structure, etc. Similarly it has been possible to add new developments such as LAN, wireless, etc to the network.

*Hardware* of internet – computers and servers (IBM, Dell, Compaq), modems - or ethernet cards for LAN- (3Com, Xircom), routers (Cisco, Sycamore), fiber-optic cables – or DSL lines or cable lines (MCI, AT&T).  
*Software* of internet – email software such as Eudora (Qualcomm), HTML programming language (text-editor such as Microsoft's Notepad or Dreamweaver), web browsers (Netscape and Microsoft), e-commerce software (Oracle), etc.

## 5. History of the Internet (Technology)

*Early Ages (1960s; 1961-67)* – Parallel developments at MIT (Kleinrock, Roberts), RAND and UCL connecting pairs of computers via phone lines (using conventional person to person links via switches); theoretical development of packet switching idea; primary interest – time-sharing among computers (and some data-sharing).

*Early Middle Ages (1970s; 1969-76)* – First network of computers built (Stanford, SRI Berkeley, UCLA and Utah) facilitated by the first building of packet switches (early routers); early network evolves into ARPANet funded by the Defense Dept.;

evolution of open architecture idea and TCP/IP protocol (Cerf, Kahn); - that each computer has a distinct IP (Internet Protocol) address, there is a compatible set of standards and rules, TCP (Transfer Control Protocol) that every node in the network follows in exporting to and importing from the network, and these common standards are only enforced for network interaction.

first software written for email to facilitate collaboration between researchers; primarily used by computer science academics and some high-tech defense personnel and concentrated on mainframes.

*Late Middle Ages (1980s; 1977-89)* – growth of LANs (facilitated by the invention of ethernet linkages) and work-stations; further refinement of protocols; simultaneous growth of several incompatible networks including some private ones; intervention of the NSF in preserving a unique compatible network (NSFNet) by a combination of cajoling and coercion (any research allocation required signing on to compatible network). Primary usage – email (now used by a larger community of academics and some private users) and FTP.

*Renaissance (1990s; 1990-99)* technologically, easily the biggest development (Fall 1990) is the invention of the WWW by Tim Berners-Lee at CERN, a truly momentous achievement. Assigns sites according to URL, writes HTML code to cross-reference files and formulates HTTP as the transfer protocol. Prior work existed (including his own program Enquire Within Enquire Upon ?) but they could cross-reference within a node not across the entire network. Suddenly all information was available to everyone.

First few years saw growth of sites containing HTML files and the writing of browser programs (that fetch and read HTML files the most famous of which was Mosaic that since became Netscape) and the growth of search engine programs (Yahoo e.g.).

Since 1995 there has been a big growth in the buying and selling of goods and services online, the advent of e-commerce.

## 6. Economic Structure

Three components to the internet economy: hardware providers (IBM, Cisco etc.), software providers (including other applications intended for e-commerce such as web design), e-commerce companies selling to businesses and consumers (Gap, United Airlines, Ebay, Amazon.com, Enron!).

## 7. Current status – Internet Usage (source NUA online)

### a. Current Usage –

|                              |                |
|------------------------------|----------------|
| <a href="#">World Total</a>  | 513.41 million |
| <a href="#">Africa</a>       | 4.15 million   |
| <a href="#">Asia/Pacific</a> | 143.99 million |
| <a href="#">Europe</a>       | 154.63 million |
| <a href="#">Middle East</a>  | 4.65million    |



[Canada & USA](#) 180.68 million  
[Latin America](#) 25.33 million



b. Rate of Growth -

## Worldwide

| COUNTRY   | DATE           | NUMBER         | % POP | SOURCE                                    |
|-----------|----------------|----------------|-------|---|
| Worldwide |                |                |       |   |
|           | August 2001    | 513.41 million | 8.46  | Nua Ltd                                   |
|           | July 2001      | 507.92 million | 8.37  | Nua Ltd                                   |
|           | June 2001      | 478.7 million  | 7.88  | Nua Ltd                                   |
|           | May 2001       | 462.57 million | 7.62  | Nua Ltd                                   |
|           | April 2001     | 460.87 million | 7.59  | Nua Ltd                                   |
|           | March 2001     | 458.11 million | 7.55  | Nua Ltd                                   |
|           | February 2001  | 455.55 million | 7.5   | Nua Ltd                                   |
|           | January 2001   | 455.55 million | 7.5   | Nua Ltd                                   |
|           | December 2000  | 451.04 million | 7.43  | Nua Ltd                                   |
|           | November 2000  | 407.1 million  | 6.71  | Nua Ltd                                   |
|           | October 2000   | 381.79 million | 6.29  | Nua Ltd                                   |
|           | September 2000 | 377.65 million | 6.22  | Nua Ltd                                   |
|           | August 2000    | 368.54 million | 6.07  | Nua Ltd                                   |
|           | July 2000      | 359.8 million  | 5.93  | Nua Ltd                                   |
|           | June 2000      | 336.52 million | 5.48  | Nua Ltd                                   |
|           | March 2000     | 309.7 million  | 5.1   | Nua Ltd                                   |
|           | February 2000  | 280.86 million | 4.63  | Nua Ltd                                   |
|           | January 2000   | 254.29 million | 4.19  | Nua Ltd                                   |
|           | September 1999 | 201.05 million | 4.78  | Nua Ltd                                   |
|           | August 1999    | 195.19 million | 4.64  | Nua Ltd                                   |
|           | July 1999      | 185.2 million  | 4.41  | Nua Ltd                                   |
|           | June 1999      | 179 million    | 4.27  | Nua Ltd                                   |
|           | May 1999       | 171.25 million | 4.09  | Nua Ltd                                   |
|           | April 1999     | 163.25 million | 3.9   | Nua Ltd                                   |
|           | March 1999     | 159 million    | 3.89  | Nua Ltd                                   |
|           | February 1999  | 153.5 million  | 3.75  | Nua Ltd                                   |
|           | December 1998  | 150 million    | 3.67  | Nua Ltd.                                  |
|           | December 1998  | 160 million    | 3.91  | <a href="#">IDC</a>                       |
|           | December 1998  | 147.8 million  | 3.62  | <a href="#">Computer Industry Almanac</a> |
|           | Sept 1998      | 147 million    | 3.6   | Nua Ltd                                   |
|           | July 1998      | 129.5 million  | 3.17  | Nua Ltd                                   |
|           | July 1998      | 119 million    | 2.91  | Nua Ltd                                   |
|           | March 1998     | 66.68 million  | 1.61  | <a href="#">IDC</a>                       |
|           | November 1997  | * 76 million   | 1.81  | Reuters                                   |
|           | January 1998   | **102 million  | 2.49  | <a href="#">MIDS</a>                      |
|           | December 1997  | 70 million     | 1.71  | <a href="#">IDC</a>                       |
|           | December 1997  | ** 101 million | 2.47  | Nua Ltd                                   |
|           | September 1997 | ** 74 million  | 1.81  | Nua Ltd                                   |

Methodology (NUA) –

Where possible, 'How Many Online' figures represent both adults and children who have accessed the Internet at least once during the 3 months prior to being surveyed. Where these figures are not available, we use figures for users who have gone online in the past 6 months, past year, or ever. An Internet User represents a person with access to the Internet and is not specific to Internet Account holders. When the figure for Internet Account holders is the only information available, this figure is multiplied by a factor of 3 to give the number of Internet users. The figure for 'Asia/Pacific' includes Australia and New Zealand. When more than one survey is available on a country's demographics, Nua will take the mean of the two surveys or, in the case where Nua feels one study may be more comprehensive/reliable than the other, Nua will

quote this figure over the other.

9. **Current Status – Internet Economy** (Center for Study of the Information Economy, University of Texas, Austin, January, 2001); More than 3 million workers are now employed in the Internet economy, generating nearly \$375 billion in revenue in the first half of 2000. Revenue from the Internet economy companies measured is growing at twice the rate of Internet economy employment, according to the study.

Furthermore, researchers project the Internet economy to contribute \$830 billion to the overall economy for 2000, a 58 percent increase from 1999.

Revenue per Internet economy employee also increased 11.5 percent in the first half of 2000 compared with the previous year, according to the study.

Researchers at UT slice the Internet economy into four parts, including technology infrastructure, Internet-related software and services, Web intermediaries and content providers, and transaction-oriented commerce Web operations.

## 10. Current Status – ECommerce

### a. Size of Consumer Ecommerce Sector in United States (B2C) –

Total U.S. spending on online sales measured by NRF/Forrester Online Retail Index. Has grown from \$2 bn in January, 2001 to \$6 billion by December, 2002.

In particular, increased from \$4.9 billion in November to \$5.7 billion in December, according to the [NRF/Forrester Online Retail Index](#). The number of households shopping online increased to 18.7 million in December from 16.8 million in November. Consumers spent an average of \$304 per person in December, compared with \$293 in November.

Forrester says that online retail sales for December 2000 totaled \$5.0 billion, while total 2000 sales were \$42.4 billion. Total 2001 sales reached \$47.6 billion.

The Forrester Online Retail Index measures the growth and seasonality of online shopping based on data collected from online shoppers. It is based on 5,000 responses fielded from an online panel from Jan. 3 to Jan. 9, 2002.

Some details

| <b>December 2001 NRF/Forrester Online Retail Index</b> |   |   |   |
|--|---|---|---|
| <b>Category</b>  | <b>Total Spent<br/>in Dec.<br/>(in thousands)</b> | <b>Total Spent<br/>in Nov.<br/>(in thousands)</b> | <b>Oct.<br/>Index Results<br/>(Dec./Nov.)</b> |
| <b>Small-Ticket Items</b>                              |   |   |   |
| Software   | \$185,440   | \$165,020   | 1.12  |
| Books  | \$280,229   | \$192,183   | 1.46  |
| Music  | \$233,058   | \$177,935   | 1.31  |
| Videos   | \$191,983   | \$135,211   | 1.42  |
| Office supplies  | \$105,439   | \$131,110   | 0.80  |
| Apparel  | \$484,027   | \$405,439   | 1.19  |
| Footwear   | \$115,899   | \$100,055   | 1.16  |
| Jewelry  | \$171,992   | \$116,796   | 1.47  |
| Flowers  | \$65,493  | \$74,805  | 0.88  |
| Linens/Home Decor                                      | \$134,732   | \$106,548   | 1.26  |
| Health and Beauty                                      | \$152,913   | \$116,064   | 1.32  |
| Small appliances                                       | \$79,053  | \$70,494  | 1.12  |
| Toys/Videogames  | \$474,676   | \$306,298   | 1.55  |
| Sporting Goods   | \$124,286   | \$94,742  | 1.31  |
| Tools and Hardware                                     | \$101,357   | \$52,220  | 1.94  |
| Garden Supplies  | \$22,408  | \$21,336  | 1.05  |
| <b>Big-Ticket Items</b>                                |   |   |   |
| Computer hardware                                      | \$512,920   | \$388,402   | 1.32  |
| Consumer Electronics                                   | \$412,745   | \$316,731   | 1.30  |
| Appliances   | \$35,904  | \$55,664  | 0.65  |

|                                   |                    |                    |             |
|-----------------------------------|--------------------|--------------------|-------------|
| Furniture                         | \$68,216           | \$70,919           | 0.96        |
| Food/Beverages                    | \$174,477          | \$153,837          | 1.13        |
| Airline Tickets                   | \$631,130          | \$690,635          | 0.91        |
| Car Rental                        | \$135,039          | \$135,276          | 1.00        |
| Hotel Reservations                | \$311,119          | \$339,609          | 0.92        |
| Other                             | \$480,361          | \$513,884          | 0.93        |
| <b>Total Spending</b>             | <b>\$5,684,895</b> | <b>\$4,931,215</b> | <b>1.15</b> |
| <b>Number of Buyers</b>           | <b>18,693</b>      | <b>16,814</b>      | <b>1.11</b> |
| <b>Average Spent per Consumer</b> | <b>\$304.12</b>    | <b>\$293.28</b>    | <b>1.04</b> |
| Source: NRF/Forrester             |                    |                    |             |

**About the index:**

The NRF/Forrester Online Retail Index measures, on a monthly basis, the growth and seasonality of online shopping based on data collected from online shoppers. The Index is based on 5,000 responses to an online panel fielded by Greenfield Online during the first 10 business days of each month. The monthly panel is weighted to Forrester Research's Benchmark Panel, which surveyed nearly 90,000 US and Canadian members of a consumer mail panel developed by NPD Group. Data was weighed to represent the North American population demographically

- b. B2B Growth – Forrester Research Report on 361 corporations. Corporations with large purchases (> \$100 million) have the greatest optimism about Net, use it for 6% of purchases and 45% of them report that they cut costs by using Net (online auctions, Internet based suppliers, etc.)

References

- a. Internet Usage – Estimate of NUA (Irish Internet Measurement company)  
[http://www.nua.ie/surveys/how\\_many\\_online/](http://www.nua.ie/surveys/how_many_online/)

Estimate of Nielsen Ratings  
[http://www.nielsen-netratings.com/hot\\_off\\_the\\_net\\_i.jsp](http://www.nielsen-netratings.com/hot_off_the_net_i.jsp)

- c. Size of Internet Economy  
<http://news.com.com/2100-1033-250915.html?legacy=cnet>

- b. B2B usage – Forrester Report January 2002  
<http://www.forrester.com/ER/Marketing/ISM.pdf>

- d. Online Retail Index – Size of B2C spending in US  
<http://www.forrester.com/NRF/1,2873,0,00.html>