The history of communications and its implications for the Internet

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Many fascinating historical analogies, many with important implications for the future of the Internet: e.g., a long history of denigration of flat rate pricing and lack of understanding of its advantagers:

Although flat-rate continues to be the predominant form in which Internet access is sold, that form of pricing is unviable. Flat-rate pricing encourages waste and requires 20 percent of users who account for 80 percent of the traffic to be subsidized by other users and other forms of revenue. Furthermore, flat-rate pricing is incompatible with quality-differentiated services.

Pravin Varaiya, abstract of
INFOCOM'99 keynote lecture

that, so far as large cities are concerned, unlimited service is unjust to small users, favors large users unduly, impedes expansion of the telephone business, tends to inefficient service, and that, as a financial proposition, is unsound.

1905 NYC study

Yet flat rates are the rule for residential phone services in the US, and have had no discernible negative effects, and many positive ones!

This presentation: concentrates on historical lessons about what people want from communication services

... consumer can sometimes surprise by rejecting technology (eg, WAP) they can also surprise by embracing it (eg, short messaging).

> editorial, "The big wireless gamble"
> The Economist, Oct. 14, 2000

Such a statement can only be made by someone ignorant of history. Rejection of WAP and enthusiastic embrace of SMS fits the historical pattern: connectivity is what matters, not content.

Motivation and outline:

- Point of view: economic and historical (what do customers want to do, how much are they prepared to pay for, how has this varied over time)
  - technology behind the scenes

- Main points:
  - Long historical tradition of mistaken overemphasis on content
  - Content is not king; connectivity is what matters most
  - Main promise of 3G wireless: increased voice usage, not Internet access
  - May need symmetric links to the home (and so may need fiber sooner than generally expected)
  - Danger of balkanization of the Internet smaller than is often feared

Example of ludicrous overvaluation of content:

What would the Internet be without “content?” It would be a valueless collection of silent machines with gray screens. It would be the electronic equivalent of a marine desert - lovely elements, nice colors, no life. It would be nothing.

E. Bronfman, Jr., May 2000

Value of bits:

service	typical monthly bill	daily usage	data rate	revenue per MB
cable	\$40	4hrs	6Mb/s	\$0.00012
phone	\$70	1hr	64Kb/s	\$0.08
cell	\$50	8min	8Kb/s	\$3.47
SMS				\$1000

Selected sectors of U.S. economy

industry	1994 revenues (billions)	1997 revenues (billions)	annual growth rate
telephone	$199.3	$256.1	8.7%
long distance	81.0	98.5	6.7
wireless	16.8	33.5	25.9
U.S. Postal Service	49.6	58.3	5.5
advertising	151.7	187.5	7.3
motion pictures	53.5	63.0	5.6
movie theaters	6.2	7.6	7.0
video tape rentals	7.0	7.2	0.9
broadcast industries			
television broadcasting	31.1	36.9	5.9
radio broadcasting	10.5	13.5	8.7
newspapers	47.2	55.3	5.4
magazines	17.4	19.9	4.6
consumer spending on "content"	113.9	133.5	5.4
subscription video	29.2	41.5	12.4
home video (rental and purchase)	17.8	20.4	4.6
home video games	3.1	4.4	12.4
newspapers	12.8	13.6	2.0
consumer magazines	9.5	10.1	2.1
consumer books	20.2	20.9	1.1
recorded music	14.7	14.9	0.5
consumer spending on phone service	70.5	85.4	6.6
sporting goods sales	53.5	64.1	6.2
airlines	88.3	109.5	7.4
national defense	281.6	270.5	−1.1

Revenues of U.S. cable TV and cell phone industries

year	cable TV (millions)	cellular (millions)
1987	\$11,563	\$942
1992	21,079	6,688
1997	30,784	25,575
2000		$\approx$ 50,000

Radio moved from point-to-point connectivity to content broadcasting, but now is moving back.

Typical usage pattern of communication services:

- first government
- then business
- then social

Thirty years ago you left the city of Assur. You have never made a deposit since, and we have not recovered one shekel of silver from you, but we have never made you feel bad about this. Our tablets have been going to you with caravan after caravan, but no report from you has ever come here.

letter written about 2000 B.C.

A fine thing you did! You didn't take me with you to the city! If you don't want to take me with you to Alexandria, I won't write you a letter, I won't talk to you, I won't say Hello to you even. If you go to Alexandria [*sc.* without me], I won't shake hands with you or greet you ever again after this. If you don't want to take me, that's what will happen. Mother said to Archelaus [probably the boy's tutor], 'He upsets me - take him away!' A fine thing you did, all right. Big gifts you sent me - chicken feed! They played a trick on me there, the 12th, the day you sailed. Send for me, I beg you. If you don't, I won't eat, I won't drink. There!

Theon Jr to father Theon
circa 200 A.D.

Long history of overemphasis on content by policymakers, in spite of the public's much greater willingness to pay for connectivity:

> In 1832, newspapers generated no more than 15 percent of total postal revenues, while making up as much as 95 percent of the weight.
>
> R. John, *Spreading the News*

Broadcasting over the telephone:

Endless fascination with the one mildly successful experiment in Budapest that lasted from 1893 until World War II, Telefon Hirmondó.

Yet annual subscription rate was 18 forints (about $7.5 in U.S. currency of 1900), while regular phone service cost 150 forints (about $63)!

Example of attitude that the phone industry had to overcome before it could grow as large as it did:

> The unlimited use of the telephone leads to a vast amount of unnecessary occupation of the wires, and to much borrowing of telephones by parties who are not subscribers. Thus the telephone system is so encumbered with calls which are unnecessary, and largely illegitimate, that the service is greatly impaired, and subscribers, to whom prompt connection is essential, become dissatisfied.
>
> Bell company announcement, 1880s

For the first 30 years of the telephone, promoters struggled to identify the killer application that would promote its wide adoption by home owners and businesses. At first the telephone was promoted as a replacement for the telegraph, allowing businesses to send messages more easily and without an operator. Telephone promoters in the early years touted the telephone as new service to broadcast news, concerts, church services, weather reports, etc. Industry journals publicized inventive uses of the telephone such as sales by telephone, consulting with doctors, ordering groceries over the telephone, listening to school lectures and even long distance Christian Science healing! The concept that someone would buy the telephone to chat was simply inconceivable at that time.

C. Fischer
"America Calling"

Many disappointing “content” ventures:

- Phone company information services
- Videotext experiments (including AT&T venture with Knight Ridder)
- Minitel
- AOL (started out as game network), Prodigy, ...

Inside stories of the Knight Ridder and Prodigy cases: demand for connectivity in unexpected settings

The Internet succeeded by accident. Email, its "killer app," was not among the original design criteria:

> The popularity of email was not foreseen by the ARPANET's planners. Roberts had not included electronic mail in the original blueprint for the network. In fact, in 1967 he had called the ability to send messages between users "not an important motivation for a network of scientific computers" ... Why then was the popularity of email such a surprise? One answer is that it represented a radical shift in the ARPANET's identity and purpose. The rationale for building the network had focused on providing access to computers rather than to people.
>
> J. Abbate, *Inventing the Internet*

Minutes of outgoing calls per day in the UK

quarter	fixed	wireless
1999q2	15.7	3.49
1999q3	16.0	3.51
1999q4	16.5	3.58
2000q1	17.3	3.37
2000q2	17.2	3.19
2000q3	19.7	2.98
2000q4	21.7	3.11
2001q1	23.2	2.91
2001q2	22.9	2.78
2001q3	23.8	2.85

British fixed and wireless usage (millions of minutes of outgoing calls)

quarter	fixed	wireless	fixed voice
1999q2	47220	4956	36979
1999q3	50608	5804	37594
1999q4	53786	7092	38869
2000q1	56728	7848	38806
2000q2	58339	8388	37783
2000q3	62783	8803	38237
2000q4	68289	10525	38536
2001q1	73525	11064	39349
2001q2	72292	10874	37419
2001q3	75064	11222	37670

U.S. wired phone usage: about 60 minutes per day

U.S. cell phone usage:

month	average daily usage
Jun-93	4.03
Dec-93	4.67
Jun-94	4.23
Dec-94	3.97
Jun-95	3.83
Dec-95	3.97
Jun-96	3.97
Dec-96	4.17
Jun-97	3.60
Dec-97	3.90
Jun-98	3.90
Dec-98	4.53
Jun-99	5.20
Dec-99	6.17
Jun-00	7.37
Dec-00	8.50
Jun-01	10.47

Reason for change in usage trend, from decrease to increase (little discussed in public forums): AT&T Digital One Rate, leading to proliferation of block-pricing plans

Why no toll-free wireless calls?

Internet access: A way to stimulate voice usage. (For i-mode, revenues from data services about equal revenues from increased voice usage. 82% of users sign up for i-mode to get wireless email.)

Conclusions:

- Connectivity, not content, is king!
- 3G wireless should be used primarily to stimulate voice usage, not to provide Internet access (and thereby may justify the huge investments it requires)
- Need to stimulate usage (wired and wireless): Encourage social interactions, video-clip swapping, etc.
- May need symmetric links to the home
- Efforts to balkanize the Internet unlikely to succeed
- Mandatory content control misdirected

More details in papers at

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