THE WEB—EARLY VISIONS, PRESENT REA
GRANDER FUTURE

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March 12, 2005

• Turing—1936 Universal computer, Wilkes—1948 E
Neumann,(Eckert and Mauchly)—1946 stored progra

• Vannevar Bush—1945-Memex, doesn't mention un

• Turing 1947 AI → (1970s applications) → 20xx hur

• McCarthy 1958—Proposal for formalizing common
from accomplished today

• 1950s SAGE system, special purpose time-sharing

• McCarthy—1959-1962-1970—universal time-shared
utility, motivated by Advice Taker proposal

• Licklider—1960—Man-Computer Symbiosis

• Roberts—1970—ARPAnet → Internet

• Engelbart—1962-1968—Mouse, linked documents

• Kay—1970—Dynabook

- Berners-Lee—late 1980s and early 90s—World Wi

- Brin and Page—1996—Google—first adequate sea

- other prophets—Nelson, etc. whom I neglect u
from ignorance.

SOME EARLY PREDICTIONS WORKED OUT—
NOT

• Time-shared public utilities. Modest success. Lack
power, needed too much handholding. Worked fine i

• Stanford AI Lab news service, 1972-1989. Prot
newspaper.

• Access to all the world's books. Still hasn't happene
steady progress for scientific articles. No economic
literature except what's out of copyright. John Ocke
the University of Pennsylvania links to more than 2
to-read books.

• On-line buying and selling. I don't think anyone pred
auctions in the 1970s.

TIME-SHARING vs. PERSONAL COMPUTE

• General purpose time-sharing was proposed in 195
ized in 1962. Gave each user his share of the comp
fingertips. What ever were punched cards? The Dig
ment Corporation PDP-6, PDP-10 series did it best
pushed in competition with IBM.

• TX-2 about 1960 was a $500,000 personal comp
first SUN was a $20,000 personal computer.

• The D.E.C. PDP-7 computers on which Unix was
and first IBM PCs were too weak, but the operating sy
adaptations to the weaknesses in vastly stronger com

TIME-SHARING vs. PCs, part 2

• The PC hell is system administration. Need AI to do
on a mass scale.

• Software bloat

• Operating systems as products require the user to d
for every new version. A time-sharing subscriber
There are probably 100 times as many system admini
should be needed.

• Presently promised "set top boxes" seem to aim at
Sysadmin is centralized but is probably too little and

FUTURE

• The present web is pretty good. The users will c
without new ideas. Those whose business is new ide
fer unless they have good new ideas. The dot com
substantially due to a large number of bad or trivial r

• Everyone has trouble using something new. Syst
understand user states of confusion. Trivial examp
confuses IP address, email address, and URL.

• It is more important for a system to understand a
fusion than to offer sympathy. (Some advocates of
computing" are hoping to get by with sympathy. My
mere sympathy will only produce annoyance.)

1970 MODEL WORLD OF THE FUTURE

This 1970 conference article "The home computer
was published in *Man and Computer,(Karger, Basel*
available as
www.formal.stanford.edu/jmc/hoter2.html.

Here are some fragments of the 1970 article, with not

"At present, a newspaper or a book is a package pro
large organization.

"In our new system, the physical production disappea
a much smaller organization to put out the same p
text and pictures. Moreover, the user does not face

decision to buy Life or Look. He will be able to read
or table of contents of each and read such items as
fancy, and the system will bill him for what he reads
source. In fact, since the cost of keeping a file of i
in the computer and making it publicly available wil
even a high school student could compete with the N
if he could write well enough and if word of mouth ar
by reviewers brought him to public attention. What,
publication in the new information system?"

Note 2000: I underestimated the resistance to being
these organizations would be able to mount. Resist
the publication organizations of non-profit scientific
I also underestimated the fraction of the cost of pr
newspaper that would persist even if the newspaper we
on-line.

Note 2004: Four years later, the biologists have take
in creating on-line journals that compete with prin
Their financial basis is page charges, which works f
because page charges are a small fraction of the cos
the research, but that model won't work for people w
living by writing.

Blogs come closest to my predictions, but they can't
mous professional writers.

2004 November note: Some of the politcal blogge
lot of money from advertisements during the election
The resulting competition should professionalize blog

"A publication is an organization that puts out a list
it has edited and recommends to its readers. It helps

produce material that it thinks will suit the readers, a
financial arrangement with them about splitting the p

"There can be a wide variety of publications of diffe
dards of writing and editing and different budgets fo
out these activities.

"However, they will all be equally accessible to all re
the only justification for an expensive editorial organ
be that it can produce a more popular package. Th
reading a package can be set by the publishers."

Note 2004: This ignores the copying problem. There
general purpose pay-by-the read mechanism. Moreov
ference between professional (full time) writing and ser
writing is likely to persist.

The star phenomenon will persist and become even m
nant.

"A reader may feel that he needs help in finding his w
the totality of literature available to him. Various pec
eager to make a living by providing it. A bookstore c
a program that when called shows the 'covers' of pu
Reviewers will produce lists for him and make mone
reads their lists or by kickbacks from the publishers.
advisers' under some catchier name will offer to ge
just for him according to a profile of his interests."

Note 2004: This hasn't happened enough to make
dependent of publications. The 1970 article didn't
account the importance of publicity and advertising.

"Advertising in the sense of something that can forc
the attention of a reader will disappear because it will b
to read via a program that screens out undesirable m

Note 2004: This didn't happen, perhaps fortunate
didn't predict spam. I am temperamentally an extrem
but the pessimists didn't predict spam either.

"Another effect is the possibility of frequent revisions
and books. An author can take into account new fac
people's criticisms, and the revision will take effect imm
Readers of an old version will be unlikely to read a v
even if it contains important changes. Better put th
in a new article.

Note 2004: I put dated footnotes on my old articles, b
their existence lures anyone to read the article again.

"Public controversy can be carried out more expediti
at present. If I read something that seems controve
ask the system if anyone has filed a reply. This, togeth
author's ability to revise his original statement, will l
to converge on considered positions more quickly than
even if they do not come to actual agreement."

Note 2000: There are various proposals, but this h
pened yet. One can imagine Bush and Gore "trut
putting on their candidates' web sites arguments a
positions of the other guy. Personal attacks too.

Note 2000 June 1: Today's New York Times has an
titled "E-Mail Messages to the Press Have Made the
Race a Cyberwar" recounting how the Gore and Bush
send dozens of messages per day to reporters. I supp
a partial realization of my 1970 prediction.

Note 2004: The campaigns have their web sites, bu
aren't the main places undecided people go to see
refuting those of the other side. Alas, TV advertising
main way of influencing the voters.

"Famous authors will not need publishers because
readers will have the system find their stuff automati

Note 2004: A try at this failed because of copying

"To summarize: the new information system will pro
lectual competition by reducing the price of entry,
readers to be selective, and will allow authors to revi
until they are satisfied that it withstands criticism a
ever will. This should make intellectual life more inte

Note 2004: This doesn't seem to happen much.
perfecting their earlier analyses, bloggers just bombar
ponents with new stuff.

"The new information system will have a profound
buying and selling. Sellers of movies, groceries, a
plumbing services and cures for baldness will find it ad
to list their wares in the information system together w

prices and availability. The user can place an order th
system as he can by telephone, but he can do much

Note 2004 : This happened but isn't revolutionory.

"(1) He can call on someone's program to scan the
sports cars and propose what it considers the best
program might even negotiate with programs repres
sellers.There's some of it now.

"(2) He can tell the system whether last year's cure fo
worked and get a summary of the opinions of those wh
to record their opinions of the cure he contemplates t

"(3) He can make an airplane or hotel reservation b
ing with a program the airline or hotel reservation co

written to tell him what is available. He need not suf
lays you now get when you call an airline or travel age
hours." All this has happened.

"(4) Individual design and construction services can
through the system although this requires the devel
computer-controlled manufacturing techniques for va
of articles. The idea is that automated design pro
produce designs for articles meeting individual specifi

Note 2004: This hasn't happened yet. Maybe it will.

"There are many more useful services that can be offer
the new information system and again the system is co
competition. Writing and storing a program and anno

availability can be a very low capital operation, and t
can collect whatever price has been set for its use."

Note 2004: This has happenened, but In the world o
is far less convenient than in a world of time-sharing—
should be.

Note 2004: The above greatly underestimates the role
and publicity of all kinds plays in creating reputation a
attention to ideas.

2004 note: My 1970 article did not see AI as as ess
now see it to help people use computers.

THE FUTURE OF PERSONAL COMPUTING INVO
BETTER THAN THE AI OF TODAY.

Example: swindle protector

- A low level protector knows about specific swindles
- Higher level can identify variants of the Nigerian sc
- High level—knows facts about swindling in general.

Example: Understanding a user's confusion.

• Suppose the user confuses IP addresses and URLs
a program asks for an IP address, and the user giv
Most present programs will simply put up an OK box
"wrong format". The user may just worry about the
the URL. A system designer who anticipated the confu
have the program say "You gave me a URL when I as
IP address."

• More generally, system administration requires know
reasoning. Evidence: The people who spend several h
my problems obviously think a lot. They understand
fix my problems, but they don't understand enough
they do it to automate their work.

LOGICAL AI IS PROBABLY NEEDED TO UNDE USERS' PROBLEMS

Logical AI involves expressing what is known about the pecially common sense knowledge, in languages of ma logic. The logical AI program infers from the senten the world and sentences about a particular situation tain course of action is appropriate. The main scientif logical AI is mathematical logic as developed since 18 methods of *non-monotonic reasoning* developed since are also needed.

Logical AI is based on study of the world and the ac achieve goals. Its main rival is based on stuying h animal neurophysiology. Both approaches have been p

50 years, and neither has reached human-level AI yet. took the geneticists about 100 years from Mendel to t code, and genetics isn't done yet.

BIG ADVANCES REQUIRE LOGICAL FORMULAT
COMMON SENSE KNOWLEDGE AND REASO

• Humans mainly communicate in facts, not just ru
grams.

• Humans reason to get new facts from old. Logicians
these rules. Gödel proved them complete.

• Reasoning programs require full first order reasonin

• Advanced help requires understanding the problem d
usually understanding the user's state of mind.

THE FUTURE OF THE WEB—PART I

• Everyone will be able to read anything. The problen
authors will be solved.

• While world population won't even double, the pub
cread by a factor of five.

• Very specialized interest will have adequate publics.

• There will be more rich stars—for better or worse.

THE FUTURE OF THE WEB?—PART II

Programs that understand

- substantial parts of natural language documents,
- facts about the world,
- facts about people's states of mind, including confu
of mind,
- can give good advice,
- and can put together programs from this informatio