THE E-COMMERCE TRAJECTORY

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INTRODUCTION

Success in the modern business world depends on an accurate understanding of the business environment and the relevance of our respective businesses to it. As changes to the environment occur at an accelerating pace it becomes increasingly important that we look further into the future so that we may anticipate the changes, and adjust our actions before they are upon us. This can be compared to driving your car; the faster you travel, the further ahead you must look. Failure to look far enough ahead and correctly anticipate the changing environment could result in serious, perhaps catastrophic, consequences.

A moving car may be a useful analogy to describe the need for business vision, but just as Newton's Laws of Motion break down as we approach the speed of light, our ability to behave as if we are driving a fast car breaks down as we approach the speed of the Internet. In our "car", our speed is limited to such an extent that line-of-sight vision is, for the most part, adequate. In the Internet world the environment is changing at such a rapid pace that somehow we must extend our vision beyond-the-horizon, and adjust for things not yet in view. It is as if we are riding a rocket, change is occurring at a blistering pace, and we are accelerating.

For businesses that are unable to adjust to, or unwilling to acknowledge, the rapid changes and new paradigm of business in the Internet world, the future is bleak; they will suffer decreasing market share and possible elimination. For businesses that can adjust, the rewards will be increasing market share and profits; 'to the victors will go the spoils'.

E-COMMERCE: A KILLER APPLICATION

Larry Downes and Chunka Mui, authors of "Unleashing the Killer App", define the term "killer application" as a convergence of technologies, products and services into a new application so powerful that it transforms industries, redefines markets, and annihilates the competition.

In the 7th century Charles Martel made effective use of a seemingly simple piece of technology, the stirrup, and changed the face of Europe.

"The stirrup made it possible for a mounted fighter to strike with his lance without falling off his horse, greatly increasing the force that could be put behind such a blow. It proved decisive in the Franks' efforts to turn back the marauding Saracens who invaded Western Europe in the eighth century, despite the superior numbers of the invaders." Charles Martel subsequently leveraged the power of his cavalry to wrest land and power from the Catholic Church and create a new world order[1]

Other examples of "killer applications" which have occurred throughout history include:

- The steamship revolutionized ocean travel and international trade, replacing the sailing ships.
- The telephone largely replaced the telegraph as a means of high-speed communication.
- The airplane revolutionized transportation.
- Television changed the way news and entertainment is disseminated to the masses.
- The computer produced an exponential increase in our ability to manipulate information, and enabled a shift of economic power from production to knowledge based.

[1] Downes, L. and Mui, C. Unleashing the Killer App: Digital Strategies for Market Dominance. (Massachusetts, USA: Harvard Business School Press, 1998), 17.

- The Internet – a child of the computer – has multiplied and globalized the impact of the computer.
- E-commerce - a child of the Internet – captures the synergistic power of the computer and the Internet. E-commerce is in the process of revolutionizing the way we do business locally and globally.

To repeat: E-commerce *is in the process* of revolutionizing the way we do business. The nature and extent of this revolution are just beginning to be understood. Perhaps only in hindsight can we truly pronounce it a "killer application", but it shows every sign of being one; an irresistible force that will alter the future of nations and shape the global economy.

THE TRAJECTORY METAPHOR

In the introduction to this paper I compared experiencing changes that are occurring in "business in the Internet world" to a riding a rocket. A further examination of this metaphor might be useful in developing in a better understanding of Internet and e-commerce dynamics.

Trajectory, Speed, and Acceleration

We can predict the future trajectory of a rocket if we know its flight history and understand the various forces that are acting upon it. Historical parameters and dynamic forces include:

- Speed: Distance traveled divided by the time of travel
- Acceleration: The rate of change of velocity with respect to time
- Thrust: the force exerted against an object
- Drag: The retarding force exerted on a moving body

In order to define our flight history and gain some perspective as to our rocket's present position I will start with a brief review of the history of the Internet.[2]

- 1968 - Packet-switched networks appear
- Dr. Leonard Kleinrock, often referred to as the father of the Internet, created the basic principles of packet switching when he was a graduate student at the Massachusetts Institute of Technology. In 1969, his team at the University of California, Los Angeles (UCLA) was the first to transmit a message over the ARPAnet, the forerunner of the Internet.
- 1969 - ARPAnet appears, using the Network Core Protocol, with four hosts
- 1983 - The term "Internet" is coined, and TCP/IP becomes standard Internet protocol
- 1984 - Domain Name Servers (DNSes) are introduced; The Internet has 1,000 hosts
- 1987 - The Internet has 10,000 hosts
- 1988 - "Internet Worm" temporarily disables about 6,000 of the now 60,000 Internet hosts
- 1989 - The Internet has 100,000 hosts
- 1990 - Tim Berners-Lee develops HTML and the World Wide Web. ARPAnet shuts down; the Internet has 300,000 hosts
- 1991 - The National Science Foundation (NSF) lifts the ban on commercial network traffic over the Internet, opening the door for the electronic-commerce explosion
- 1992 - The Internet has 1 million hosts and 50 Web sites worldwide IP multicast is implemented for the first time
- 1993 - Mark Andreesen of the National Center for Supercomputing Applications launches the Internet browser Mosaic X for major platforms
- 1994 - The Internet has 3.2 million hosts and 3,000 Web sites
- 1995 - 25,000 Web sites exist on the Internet; domain name registration is no longer free. The Internet has 10 million hosts
- 1997 - The Internet has 19.5 million hosts and 1.2 million Web sites
- 1998 - The Internet has 36.8 million hosts and 4.2 million Web sites

[2] http://www.infoworld.com/cgi-bin/displayStory.pl?/features/991004net_birth6.htm [05-10-1999]

- 1999 - The Internet has 56.2 million hosts and 7.1 million Web sites. Forrester predicts that online retail sales will grow from $7.8 billion in 1999 to $108 billion in 2003.

The graphs below illustrate Internet host and Web site growth during this period thus giving us a picture of trajectory to date.

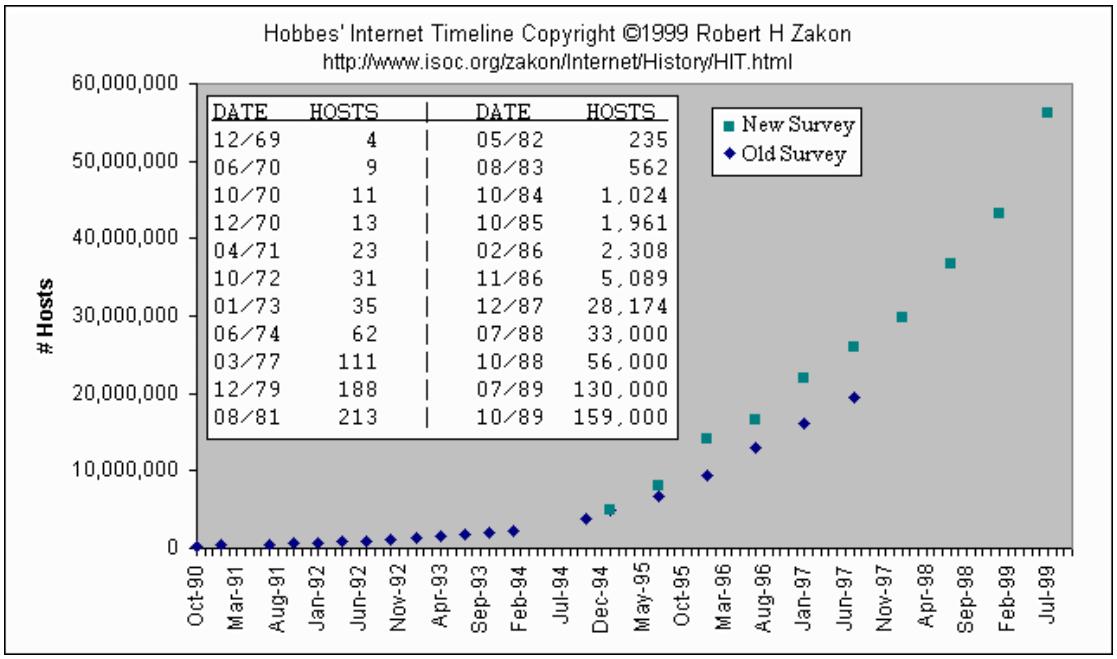

FIGURE 1, INTERNET # OF HOSTS

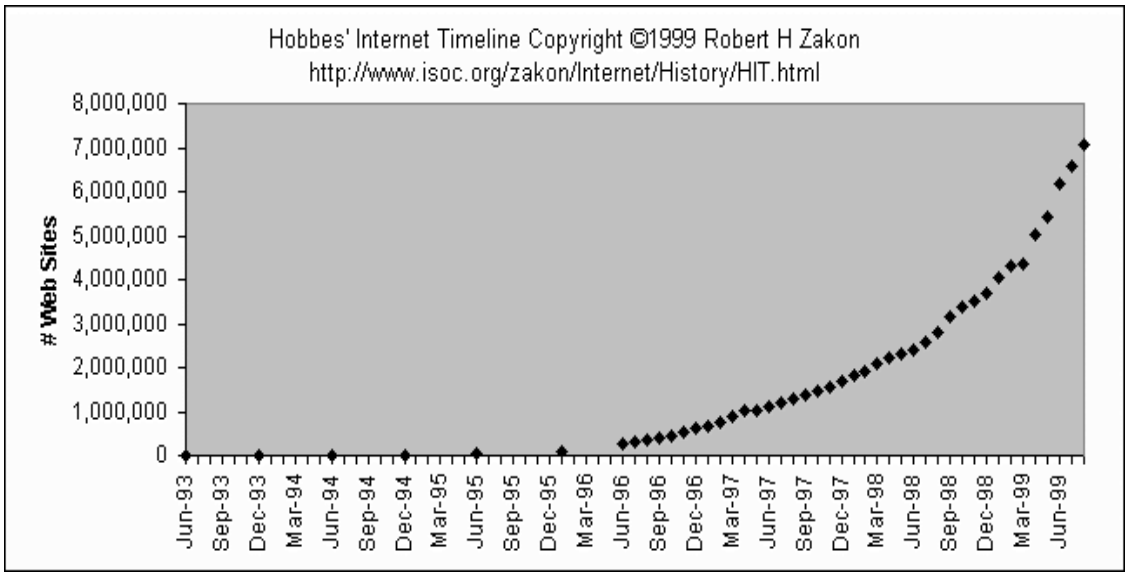

FIGURE 2, INTERNET # OF WEB SITES

It is possible to determine more than just trajectory history from this data, it is also possible to derive a rate of change i.e., speed. Further, by casual inspection of our graphed data, we note that the rate of change is not a linear value - it is increasing, hence we can also derive acceleration.

The above data paints the global picture of Internet trajectory. Of perhaps greater interest to Thailand is what the regional picture looks like. The below chart (fig. 3) taken from the April 17, 1998 issue of AsiaWeek magazine shows the current size (as of 1998) and projected growth trajectory for Internet population in the Asia-Pacific region.

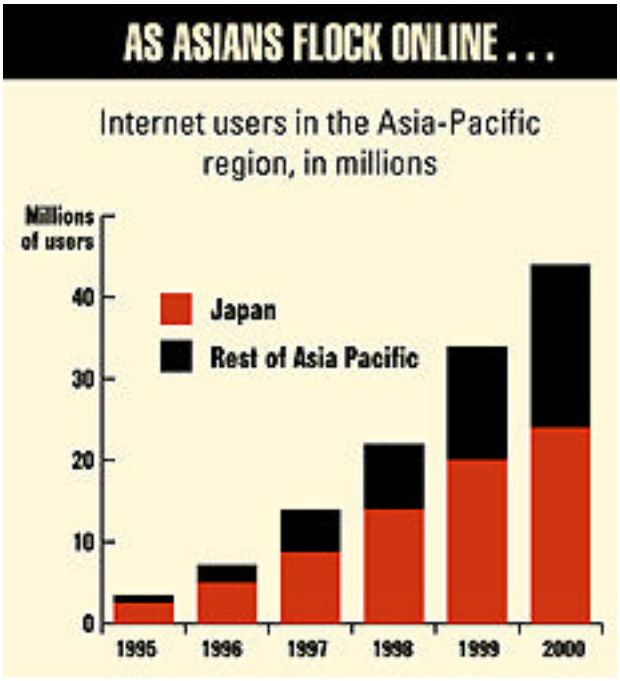

FIGURE 3, ASIANS ONLINE

Of more specific interest is the current size and projected growth for Thailand. The following excerpt from the September 22, 1999 edition of the Bangkok Post includes an estimate of the current Internet population in Thailand…

> "numbers of Internet users was recently estimated by ISP Club president Prasart Sribhadung at around 600,000, or 1 percent of the population. A similar figure was presented by Access Media International, which claimed around 1.05 percent of the population used the Internet."[3]

…and a projection of future growth extracted from a Thailand Development and Research Institute (TDRI) report sponsored by the Public Health Ministry.

> "if GDP (were to grow) by two percent, the numbers of Internet subscribers would be 712,769, or 1.14 percent of the population, next year. If the economy continued growing at the same rate for the next five years, Thailand would reach 2,786,951 Internet subscribers in the year 2005, or 4.29 percent of its population. Similarly, if GDP growth was six percent, there would be 3,214,472 Internet subscribers in the year 2005 or 4.94 percent of the population."[4]

[3] Karnjana Karnjanatawe, Internet users predicted to rise four-fold by 2005, Bangkok Post, September 22, 1999
[4] ibid.

The below chart depicts present size and future growth according to the above figures.

Note: I have inserted some extrapolated data for years 2001 and 2003 to more clearly depict the upward curve.

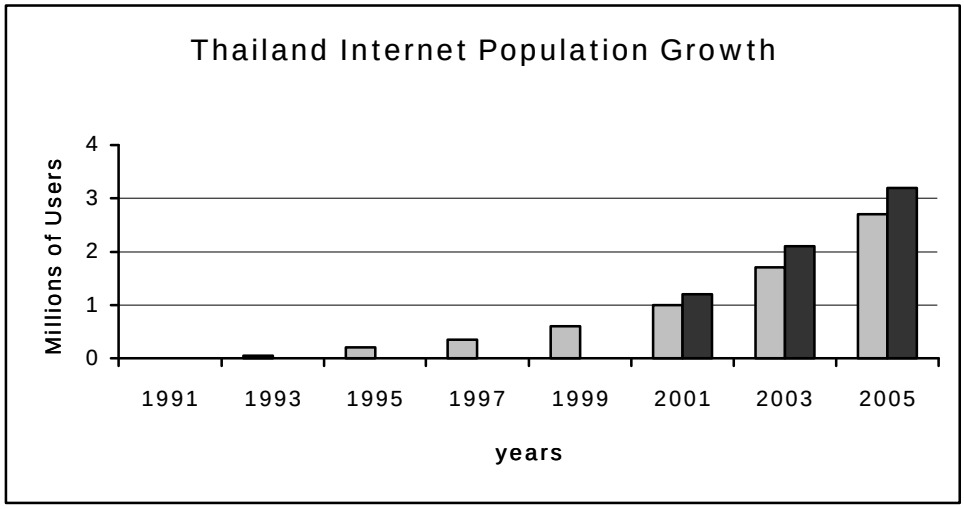

FIGURE 4, THAILAND INTERNET POPULATION

(Note: black bars show the larger of TDRI's two population predictions)

Again by inspection we can easily see that the trajectory of growth is not linear but is curving upwards, i.e., accelerating.

THRUST

PROCESSOR SPEED

Processor speed is not a measure of rocket speed (Internet growth rate) per se, but it shares responsibility for that speed, in that it makes a critical contribution to the utility of the rocket.

In 1974, Intel founder Gordon Moore, at the annual Semiconductor Industry Association forecast dinner, stated that every 18 months chip density (and thus computer power) would double.

The following chart shows the theoretical upward curve of Moore's projected density increase with respect to time over a nine-year period.

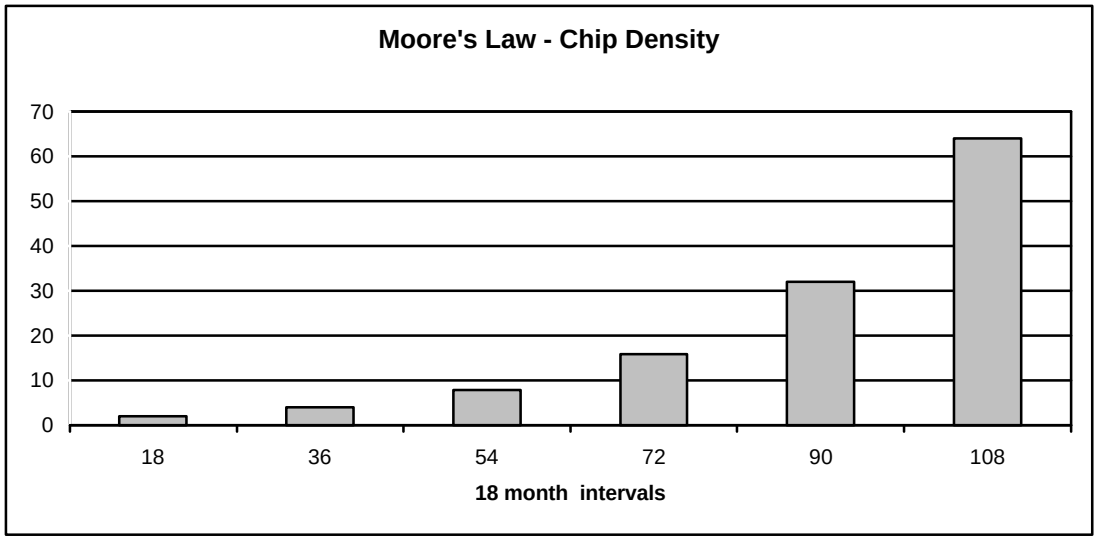

FIGURE 5

The below text and table from BusinessWeek Online chronicle Intel's evolution of chip density.

> "Intel, which produced the first computer-on-a-chip in 1971 from a couple thousand transistors, now cranks out chips with millions of transistors. Today's chips crunch numbers faster than a Cray supercomputer could in the late 1980s. Within 15 years, Intel expects a descendant with a billion transistors that could whip a dozen of today's fastest supercomputers."[5]

CHIP	PUBLIC DEBUT	INITIAL COST	NUMBER OF TRANSISTORS	INITIAL MIPS*
4004	11/71	$ 200	2,300	0.06
8008	4/72	$ 300	3,500	0.06
8080	4/74	$ 300	6,000	0.6
8086	6/78	$ 360	29,000	0.3
8088	6/79	$ 360	29,000	0.3
i286	2/82	$ 360	134,000	0.9
i386	10/85	$ 299	275,000	5
i486	4/89	$ 950	1.2 MILLION	20
PENTIUM	3/93	$ 878	3.1 MILLION	100
PENTIUM PRO	3/95	$ 974	5.5 MILLION	300
PROJECTIONS				
786	1997	$ 1,000	8 MILLION	500
886	2000	$ 1,000	15 MILLION	1,000
1286	2011	N/A	1 BILLION	100,000

*Millions of instructions per second

DATA: INTEL CORP., DATAQUEST INC.

TABLE 1, INTEL PROCESSORS

The following chart makes use of data extracted from the above table to graphically depict the increase in processor speed from 1985 to 1997.

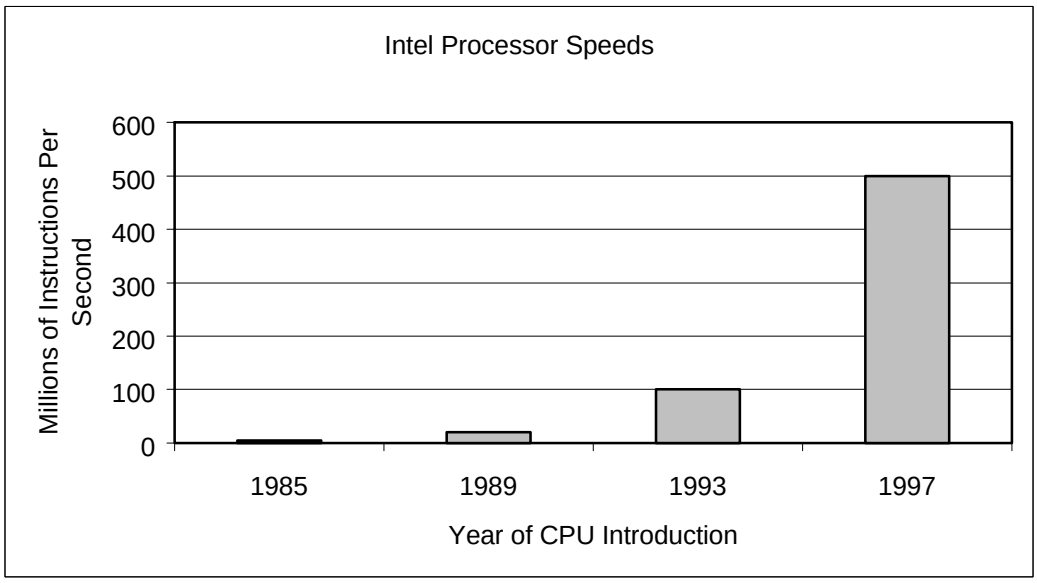

FIGURE 6, INTEL PROCESSOR SPEEDS

[5] BusinessWeek Online, March of the Microprocessor, 6 December 1996

It is interesting to compare the rate of increase between the theoretical prediction of Moore's Law and the actual increase achieved by Intel. The actual increase follows the prediction fairly well and it is expected to continue this upward rate of improvement for some time to come.

It does appear, however, that there will be some turbulence in the sky ahead. We are approaching the theoretical limit for chip density utilizing the current chip construction technology.

According to Bell Labs and Lucent scientists, "the smallest feature in common semiconductors today is a thin structure that is part of a chip's "field-effect transistors." Today, these "gates" are only an amazing 25 atoms thick, and Bell Labs and Lucent scientists expect that the evolution of current technologies will shrink these gates to a mere 5 atoms by 2012.

So it would seem that we can still miniaturize quite a bit. But the problem, they say, is that the smallest practical gate has to be around 8 to 10 atoms thick to work. So even if our miniaturization techniques allow us to build five atom thick gates, they may not work."[6,7]

There appears to be a limit then to our ability to shrink chip size and thus increase processor speed using the present technology. Other possibilities for continued advance are, however, beginning to appear on the horizon.

> "experiments now going on using DNA for computing (http://www.sciam.com /askexpert/computers/computers6.html), or leech neuron computers (http://www .sciam.com/1998/1198intelligence/1198yambox2.html), or quantum computing (http://www.eetimes.com/story/OEG19990428S0015), or computers built on chaos theory (combining these and other technologies - http://www.sciam.com/1998 /1298issue/1298techbus3.html), may be the seeds of tomorrow's updates to Moore's Law."[8]

I will not expand on any of the technologies mentioned in the preceding paragraph; the interested reader may pursue the imbedded links for additional information. These technologies may or may not mature to become practical solutions of any sort, let alone become the next generation of technology that will power the future of computers, but given our recent history of achieving major technological breakthroughs it seems more likely that we will solve whatever problems are before us in this area. Indeed the next generation of "chip" technology may make the rate of increase predicted by Moore's Law seem slow.

In general a tool becomes popularly adopted in proportion to it's utility. The utility of the Internet is based on the synergistic mix of technologies that comprise it. Thus Internet population can be seen as a reflection of the utility of that technological mix. Processor speed, being a critical element of that mix, is one of the primary forces of "thrust" that propel our Internet rocket.

The Internet growth charts (fig.1 and 2) show an interesting similarity to the sharp upward curve for processor power predicted by Moore's Law and realized by Intel (et al.). Other critical elements include (but are not limited to), storage, software, bandwidth and the network itself. All of these are contributing elements to the thrust of our rocket. This paper cannot hope to cover in depth any, let alone all, of the aforementioned elements but I will briefly address network connectivity, bandwidth and storage.

CONNECTIVITY

Robert Metcalf, founder of 3Com Corporation, made the observation that networks increase in value with each added node or user. More specifically "Metcalfe's Law values the utility of a network as the square of the number of its users."[9]

As an example of this, imagine that you own the only telephone in the world. It would perhaps have some value as a curiosity piece, or a rare item, but its utilitarian value would be zero (at least as a communications device). Now imagine that we add one more phone connected by one wire to some randomly selected point on the globe. It may have some use at this point but its value would

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6 http://www.abcnews.go.com/sections/tech/DailyNews/chips990623.html

7 http://www.compaq.com/rcfoc, 12 July 1999

8 ibid.

9 Downes, L. and Mui, C, 5.

still be very limited. Now let's begin to double and redouble the number of connected phones that populate the planet. We quickly reach a "critical mass" at which the networked phone becomes "useful", and its utility continues to grow as the network expands.

Metcalfe's Law yields the following corollary: The rate of network expansion (growth rate) will be in direct proportion to the value of the network.

A consequence of this is that growth rate and network utility work on one another in a kind of snowballing effect. As this paper is being written for a seminar in Thailand perhaps snowballing is a poor metaphor to choose, but I cannot think of another to better illustrate this point so I will attempt to explain. Imagine a snowball rolling down a snow-covered hill. It starts small, but as it rolls other snow sticks to it and it becomes larger. The larger it gets, the greater the amount of snow that sticks to it as it makes each revolution, and thus it grows at an ever increasing rate. In other words, the bigger it gets, the faster it gets bigger.

Thus as our network grows and becomes ever more useful, increasing numbers of people want to join it (and do) to take advantage of its increasing utility, which further increases its utility, encouraging even more people to join, and so on. In other words, the bigger it gets, the faster it gets bigger – snowballing. The Internet growth rates shown in figures 1 and 2 are, to a significant extent, due to this phenomenon.

STORAGE

"640K ought to be enough for anybody." -- Bill Gates, 1981

Storage being of fundamental importance to computer power / utility is of fundamental importance to our Internet rocket. Failure of storage to keep pace with the other advances in computer technology, such as processor speed, would result in a bottleneck that would inhibit Internet growth and thus become an element of drag rather than thrust. Fortunately this is not the case; advances in all areas of storage technology have met or exceeded advances in processor technology.

The opening quote to this section, referring to primary memory, seems humorous to us now. Today's computers purchased for home use are commonly configured with 64 Mbytes of RAM (by no means the upper limit), 100 times greater than the maximum envisioned by Bill Gates in 1981, and the speed-size-cost ratio just keeps on getting better – faster, smaller, cheaper.

Secondary storage has kept pace as well. Ten years ago a 20 Mbyte hard-disk was a reasonable size for an average PC, today disks larger than 10 Gigabyte are readily available and affordable for home use PC's -- a 500 fold increase.

The future promises even further improvements.

> "Oct.4News.com (http://news.cnet.com/news/0-1003-200-805990.html? tag=st.ne.1002.thed.1003-200-805990) describes IBM's new ability to store 35.3 billion bits (4.3 gigabytes) of data in each square inch of a disk's surface. That's a 75% increase over their latest capabilities, announced only five months ago!"
>
> > *"...each square inch of disk space could hold 3 hours and 15 minutes of MPEG-2 compressed video, about the equivalent of two full-length movies; nearly 77 hours of MP3 compressed audio; or the text from 2,187,5000 sheets of double-spaced typewritten paper, which would make a stack 730 feet high, or laid end-to-end, would stretch some 380 miles, which is farther than the distance from San Francisco to Los Angeles."*
>
> "It means a standard 3.5 inch PC hard disk drive holding a half-terabyte. It means products within two years, according to IBM's director of recording head technology, Bob Scranton. (http://www.techweb.com/wire/story/TWB19991006S0002)"[10]

External storage technologies such as laser optical disks (e.g., CD, DVD) have also made notable gains and progress continues to be made.

> "(C3D has) developed a "fluorescent multi-layered storage technology" that uses regular (incoherent) light rather than a laser to store data in (initially) up to ten layers within a transparent disk. C3D expects its first product to be a read-only disk ("FMD-

[10] http://www.compaq.com/rcfoc, Oct. 11, 1999

ROM") holding 140 gigabytes (yes, that's eight times larger than a DVD), which will be able to read data at 1 gigabyte/second (http://www.c-3d.net/home.htm). Indeed, according to the Oct. 4 BBC News (http://news.bbc.co.uk/hi/english/sci/tech /newsid_464000/464846.stm), they have demonstrated a "...fully-working prototype!" [11]

BANDWIDTH

Strictly speaking bandwidth is the range of frequencies that a given signal occupies. However, as bandwidth is directly proportional to the amount of data that can be transmitted or received per unit time, it is popularly used as a synonym for speed.

Sufficient bandwidth is of fundamental importance to the utility of networks; Internet or otherwise. As the total number of Internet users has rocketed up, so has individual and cumulative thirst for data. This is due in part to the growing importance of the Internet as a communications / information channel and in part due to the increasing amount of data intensive multimedia traffic being passed (e.g., audio, graphics, video, etc.).

The next three charts are relevant to regional and local bandwidth increases. The first two (show below) from AsiaWeek Online show the correlation between Internet traffic volume and the regional increase in trans-ocean capacity (bandwidth).

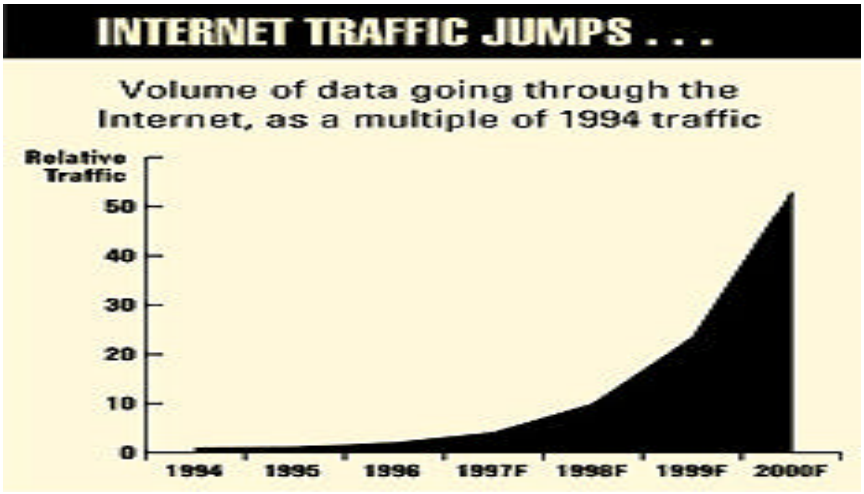

FIGURE 7, INTERNET TRAFFIC JUMPS

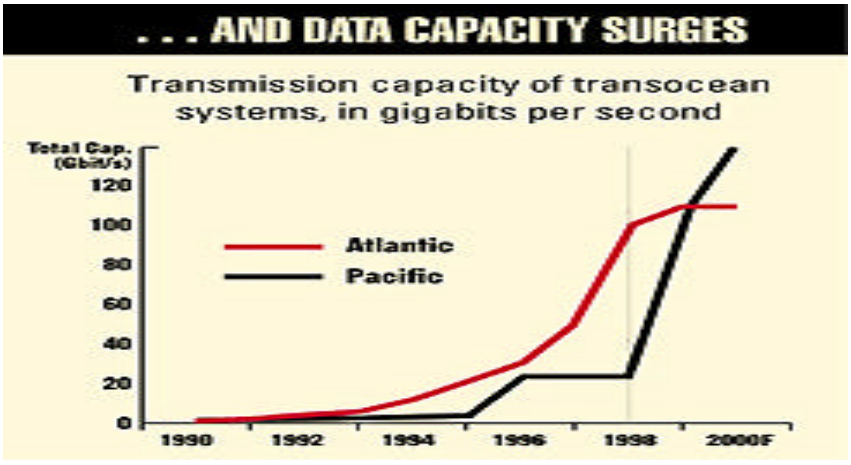

FIGURE 8, TRANS-OCEAN CAPACITY
(note: the upper curve represents Atlantic capacity)

[11] ibid.

The next chart shows the increase in international bandwidth for Thailand from 1992 to 1999.

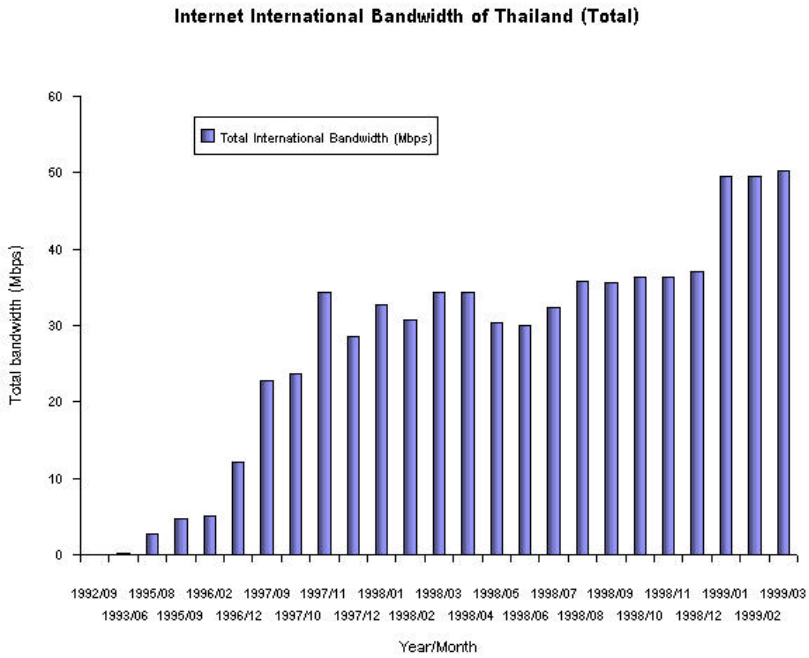

FIGURE 9[12]

I will not detail the history of global bandwidth increase here; let it be suffice say that it has followed a path similar to technological advances in other areas. The following information will, however, provide some insight into future bandwidth growth potential.

> "a single state-of-the-art fiber can now carry not one, but 160 full 10-gigabits/second data streams (each stream a different wavelength, or "color" of light) -- that's 1.6 terabits/second per hair-thin fiber (http://www.news.com/News/Item/0,4,36073,00.html).
>
> But that may soon seem like a local phone wire -- according to the July Gilder Technology Report (http://www.gildertech.com/), new advances promise to raise the number of "colors" that can be carried on a single fiber from 160 to 2,000! And each fiber will be able to carry that 20 terabits/second of data as far as 2,000 miles without having to amplify (regenerate) the signals!
>
> (And don't forget that hundreds of fibers can be combined into each cable, so the data capacity of even a single bundle of fibers will be beyond comprehension.)"[13]

Fiber optics is only part of the bandwidth mix of course, but it is certainly a key one. Other technologies such as xDSL, and "cable modems" are also making significant contributions to the bandwidth technology mix. The aggregate effect is another powerful component of thrust.

THE ROCKET: E-COMMERCE AND THE INTERNET

I have, to this point, attempted to paint a picture of the Internet as a rocket in flight. I have implied, without offering much evidence, that e-commerce is riding on the back of that rocket. While this link is perhaps intuitively obvious to so some, I am afraid that it is a little less than obvious to others, so I will try to clarify the connection.

E-commerce is not synonymous with the Internet. In fact businesses-to-business electronic transactions have been taking place over proprietary networks since the 1960's. Increasingly,

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12 www.nectec.or.th/nectec

13 www.compaq.com/rcfoc, Aug. 16, 1999

however, as security and reliability issues have been addressed, businesses are switching to the Internet as their primary network of choice for business-to-business e-commerce.

Unlike business-to-business e-commerce, business-to-consumer (retail) e-commerce as it is popularly defined today could not exist without the Internet, i.e., individual consumers buying and selling via computers, connected via the Internet.

The below chart from Forrester Research depicts recent U.S. e-commerce revenues and predicted growth for the near future.

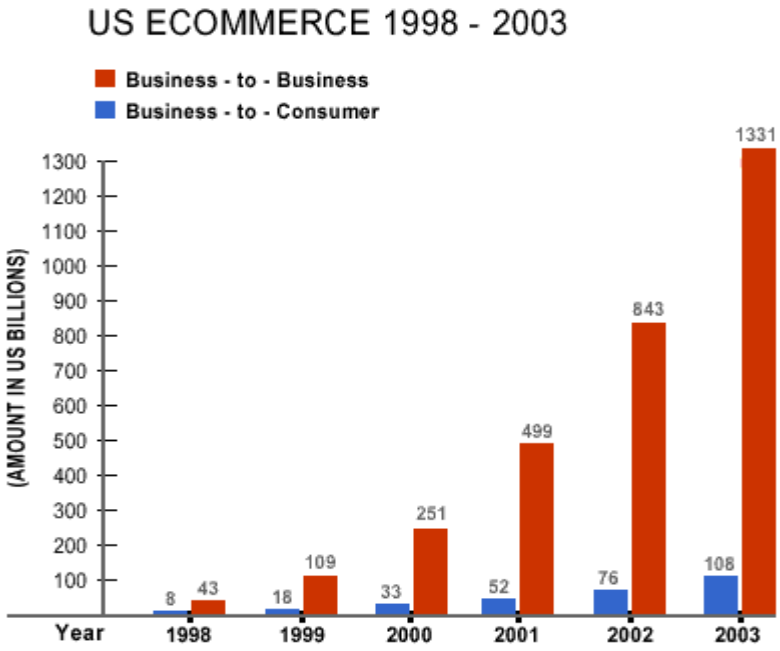

FIGURE 10[14]
(note: the smaller bar of each pair indicates business-to-consumer revenue)

The upward slope of retail e-commerce seems deceptively shallow displayed at the scale used in the above chart so I have broken out business-to-consumer e-commerce revenues in the chart below.

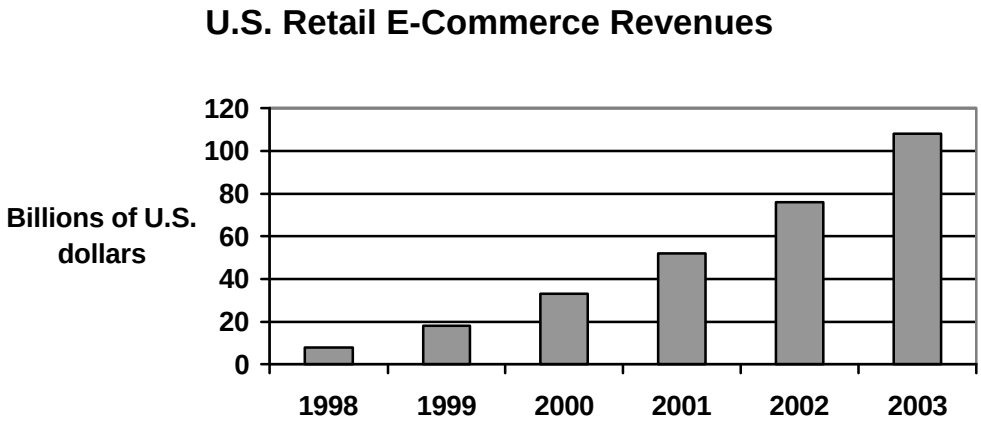

FIGURE 11, U.S. RETAIL E-COMMERCE

[14] http://www.nua.ie/surveys/analysis/graphs_charts/comparisons/ecommerce_us.html

The next chart illustrates the relationship of the total U.S. Internet population to the number of "online shoppers".

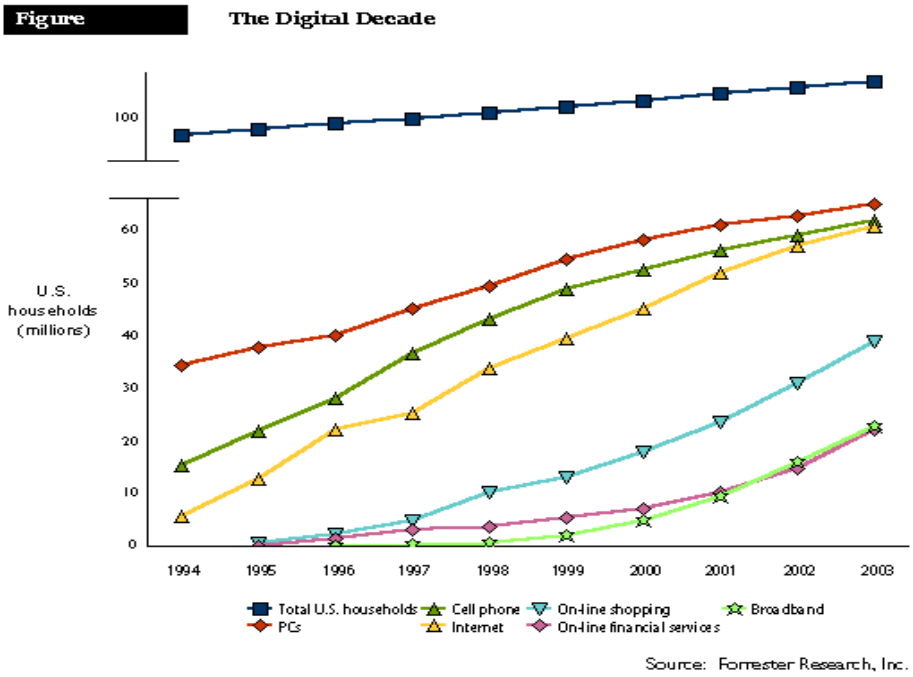

FIGURE 12, THE DIGITAL DECADE[15]

(note: 4th curve from bottom = Internet households; 3rd curve from bottom = online shopping; household average size is approximately equal to 2)

The above charts imply a close relationship between Internet population growth and escalating e-commerce revenues, and a relationship does exist without doubt; fortunately, however, other factors also come in to play. I say fortunately because although Internet population is rocketing upward now, it is statistically impossible to maintain the current rate of growth indefinitely.

Certainly the expanding Internet population means more shoppers with more money to spend, but it is the utility of the Internet that has driven that population growth. It is thus the Internet created customer base coupled with the utility of the Internet itself as effective tool for commerce that drives revenues; ergo e-commerce rides the Internet rocket.

Drag

Drag for a "real world" rocket is comprised of retarding forces such as friction (due to air) and the downward pull of gravity. Similarly, for our virtual e-commerce rocket, drag consists of any forces that impede or slow progress.

E-commerce drag forces include (but are by no means limited to), security concerns, legal issues, inadequate infrastructure, taxes, regulation, inadequate education and lack of vision.

For the most part, these components of drag exist globally, but the specific values vary (often greatly) from one region to another. For example, an element of infrastructure, such as a communications backbone, is vital from both global and local perspectives, but the local value of drag for this component would vary as the ratio of local demand to the ability of the local backbone to meet that demand. Using similar lines of reasoning it should be possible to derive local values of drag for most components.

An excerpt from an article entitled "CEOs aim to set global rules for E-Business" offers the following global perspective.

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[15] Forrester Research, Inc., www.forrester.com

> "The Global Business Dialogue on E-Commerce (GBDe) has identified nine issues, including taxation and tariffs, intellectual property rights, consumer confidence, and authentication and security, where they say uniform guidelines are needed to foster online commerce. Its (the GBDe) main goal is to prevent a situation in which local governments create a patchwork of conflicting policies and laws that could create obstacles to the emerging online economy."[16]

Excerpts from an article that appeared in the 29 September 1999 issue of the Bangkok Post offer a local perspective.

> "Speaking at the CIO/CEO Forum'99, Thailand Management Association executive director Charnchai Charuvastr said that Thailand needed to invest more in IT and e-commerce in order to be competitive, particularly in the face of coming liberalization due to the AFTA and WTO agreements.
>
> Switzerland's Institute of Management Development recently ranked Thailand 31st out of 47 countries for competitiveness behind neighboring countries such as Malaysia, which was 24th.
>
> Also speaking at the conference was Compaq Computer managing director, ML Chaivat Chayangkool, who said that without electronic commerce in Thailand, the country cannot exist in the era of globalization. To catch up with global trends, the country must prepare itself in terms of human resources and skills, electronic commerce laws and provide certification authorities (CA) in order to create business trust.
>
> Sahaviriya OA executive chairman and CEO, Min Intanate, said factors that would push the e-commerce market in Thailand included current attempts to build up various e-communities that eventually would be channels to sell products online. However, there were some problems Thailand had to address, he said, such as computer literacy skills, which are extremely low compared to those in the US.
>
> Another problem he cited was a lack of e-commerce laws here. "In the USA, there are around 300 e-commerce and related laws while there are only six drafted laws in Thailand," he said.
>
> He added that Thailand does not have the basic foundations needed for building up e-commerce. "We do not even have a national e-commerce plan," he noted." [17]

While it is important to proceed with all possible haste to address these many issues, it is equally important to not act too hastily. Laws, for example, to support the use of e-commerce relating to issues such as electronic signature, contract enforcement, intellectual property, fraud and theft are necessary to promote a safe business environment, but badly chosen laws or excess regulation will hamstring enterprise and innovation and contribute to a continued slide down the list of competitively disadvantaged nations in the region (see para. 2 of above article).

Each of the "drag" issues mentioned in this section deserves thorough analysis and discussion. Such in-depth inspection is, unfortunately, beyond the scope of this paper.

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[16] James Niccolai, CEOs aim to set global rules for E-Business, IDG News Service\San Francisco Bureau, September 09, 1999

[17] Karnjana Karnjanatawe, Thailand urged to embrace e-commerce,
Govt warned over lack of support, Bangkok Post, 29 Sep 1999

CONCLUSION

"Perspective is worth 50 IQ points."
Alan Kay, Apple Computer[18]

Individually the various elements of the technological mix that comprise the Internet are complex. The interactions / interrelationships of these elements add further layers of complexity. Interaction of the technology with the environment (business, social, etc.) complicates the issues further still.

Yet it is vitally important that we understand all of the layered complexities if we hope to increase thrust, decrease drag and effectively utilize e-commerce to compete successfully both locally and globally. It is vital to individual businesses and it is vital to the future of the Thai economy.

It is often necessary take a few steps back from a picture before you can understand what it is you are looking at. The details that you can see clearly at close range often do not make sense until you are at a distance where the relationship of one detail to another is apparent. "Perspective," as Alan Kay said, "is worth 50 IQ points."

This paper provides a framework for understanding e-commerce in relationship to the technical infrastructure that supports it and the environment in which it exists. A step back allows wide perspective and a better understanding of the details in context to one another, and a step closer enables close examination of individual elements.

The scope of this paper was limited by the availability of my time to work on it. I acknowledge that many relevant points were not addressed and those that were addressed were often given very brief treatment.

If anyone would like to discuss (or argue) any of the facts, issues or opinions presented in this paper, my email address is <rmmx@ksc.th.co>.

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