The World at Stage III, but the Net at Stage II

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This article proposes that there is a recognizable and predictable life cycle to important general enabling technologies such as the railroad, or the telephone, or the ''Net.'' This life cycle, in simple terms, consists of three stages: A stage of experimentation and development; a stage of societal concern with issues of equity and access, with concomitant regulations; and a stage when the emphasis shifts to efficiency and effectiveness, with concomitant emphasis upon competition and deregulation. The point of this life cycle analysis is that it illuminates the phenomenon that while the great previous general enabling technologies of the 19th and 20th centuries have all recently entered their third, deregulatory, stage, creating a Stage III mind-set, the Net is only just entering its second, regulatory, stage. From this analysis, from the tension thereby revealed, some issues and paradoxes can be illuminated and understood, and others revealed for further analysis. The thrust of this article derives from the thesis that the Net is entering a very different phase in its likely life cycle than that of the society around it. An examination of some of the characteristics of this phenomenon will, we hope, be illuminating.

Background

It would be hard not to recognize that over the last quarter century, particularly in the last decade, there has been throughout the world a dramatic swing of the pendulum away from central control and toward deregulation, privatization, greater competition, and more local control within organizations and governments. The manifestations are numerous and dramatic, from the divestiture of AT&T and the 1996 Telecommunications Reform Act, to the deregulation of airlines around the world, and the implosion of the Soviet empire. This phenomenon, it can be argued, is to a large degree a consequence of improved information technology (Koenig, 1990a; Malone & Benjamin, 1987). The more effectively we can communicate information, then the more it is the case that appropriate decisions can be made on the spot by the person or persons affected. Centralized decision making is appropriate for an information-sparse environment, which is the reason of course that the military, operating in an environment with poor and contradictory information, what Clausewitz famously characterized as the ''fog of war,'' is the classic centrally controlled hierarchy. As information and communications improve, then more and more subtle, more particular, more individualized decisions can be made locally.

This theme and themes of its type are hardly novel. There is a substantial literature on long-wave business cycles, (Burns, 1969; Freeman & Perez, 1988; Kondratieff, 1984; Schumpeter, 1939) and discussion of whether they are a true phenomenon or an artifact, and to what degree they are technologically driven (Dosi, 1988; Schmookler, 1966). The impact of information technology upon the economy is a related theme that has also commanded great attention (Beniger, 1986), in particular the issue of the ''productivity paradox'' (Banks, 1989; David, 1990; Koenig & Wilson, 1996; Roach, 1991). The information technology theme is, however, far larger than the productivity paradox issue, and it is, in fact, an umbrella theme that includes important sub-themes that have substantial literatures in their own right. For example, ''just-in-time inventory'' driven, it is argued, by the increasing capability of information technology in facilitating producer/supplier communications, and ''down-sizing,'' ''core competencies,'' and the ''virtual company,'' all driven, it is argued, by the increasing capability of information technology shifting the balance point in the make-versus-buy spectrum to the buy end of the spectrum (Malone & Rockart, 1991; Malone, Yates, & Benjamin, 1987).

It must be noted, however, that the effect of information technology is context-specific and that broad generalizations typically have only a loose fit (Francis, 1986), and that there is much contention, even about overall trends (Buckland, 1989, 1990; Koenig, 1990b).

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There is, however, another more subtle and more coincidental reason as to why the pendulum has swung toward deregulation and local control, a reason that is far less recognized. If one thinks of the great technological innovations that have affected society so greatly in the last century and a half, the industrial age, particularly the great enabling technologies—the railroad, the telephone, the dynamo and the grid (the electric power distribution system), and commercial aviation—one can observe a common pattern among them, a life cycle that they all share to a significant degree.

That life cycle has three stages:

> First, the technology is introduced, experimented with, and developed in a relatively laissez-faire fashion.
>
> Second, the technology is recognized as being not just a new toy or a luxury, but something of great importance, even fundamental importance, to society. Societal concerns emerge as to how to provide broad, fair, and equitable access to this new technology. This, in turn, requires the establishment of some sort of structure and concomitant regulation, to ensure equity and access.
>
> Third, as the technology becomes near pervasive and societal consensus has emerged as to how to provide that fair and equitable access, then the emphasis can and does shift back to promoting greater competition among providers to thereby enhance efficiency and effectiveness, and the bywords become competition and deregulation.[1]

These life cycle stages are most clearly seen in telecommunications, particularly telephony, and in commercial aviation. The same cycles can be seen however, though somewhat less pronouncedly, in railroads, and in the dynamo and the grid.

The stages and the key events defining those stages of the major enabling technologies are laid out in the matrix below (Fig. 1). Note, the events delineated are the most salient events from a North American perspective, but the matrix could well be filled in from a U.K. prospective with the Beaseley report replacing the AT&T divestiture for example, or from a German or other perspective. The timeline would change slightly, but not dramatically.

A second note is also required at this point. The word ''enabling'' has been chosen to characterize those major technologies that are not so much important in their own right, but are important for what they enable to be done, as for example railroads enabling economies of scale in agriculture, as opposed to technologies such as television or the motion picture which are of relatively minor importance as enablers, but serve primarily as ends in themselves.

That other subtle and more coincidental, but very important, reasons for the dramatic swing of the pendulum away from central control in the last quarter of the 20th century, has been that all of the great evolving technologies mentioned above (each following the same general life cycle, some starting in the 19th century, some starting in the 20th century, some following their life cycles more rapidly than others) have all, more or less, coincidentally entered into the third stage, the deregulatory stage, of their life cycle at roughly the same time (the last quarter of the 20th century).

The consequence of this convergence of third-stage technologies is that society has grown accustomed to technologies now arriving at Stage III, the deregulatory stage of their life cycles, and has come to assume that this is a generic society-wide phenomenon, almost a general stage of societal or economic development.

Enter the ''NET''

But, the Net is not entering Stage III, it is just starting Stage II—societal concern about fair and equitable access, the stage that requires structure and regulation. (Fig. 2).

The thesis here, then, is that the industrial age is at Stage III, but the Net is at Stage II, and there is a fundamental disconnect (Figs. 3, 4). Our society perceives itself to be in a generic Stage III, and yet it is becoming aware, if only in a pre-conscious knee-jerk and not yet clearly articulated fashion, that as far as the network age goes, we are in a very different stage.[2] The more important the net becomes, the more of an issue the disconnect becomes.

The decency provision of the 1996 Telecommunications act, however misguided, is a classic second stage symptom. Other symptoms are the recent ''summit conference'' on Equity in the Information Superhighway'' organized by the American Library Association with support from the Wilson, Kellogg, MacArthur, and Annenberg foundations, and the Paris meeting of the ''Platform for Internet Content Selection'' (PICS) to develop a self-rating scheme for Internet content.

The disconnect is amplified by the fact that the arrival of the industrial age at Stage III is, in fact, relatively recent and is one that we are still accommodating ourselves to, from major problems such as navigating the political debris of the Soviet littoral to lesser irritants such as the complexities of selecting our long-distance carrier, with considerations being not only apparent price and quality of service, but also the opportunity value of frequent-flyer miles. Now the Net is forcing society, overnight it seems, to reevaluate everything again.

[1] Deregulation in this context refers to deregulation at the macro level, particularly in regard to issues such as competition, ease of market entry, etc. It is not meant to imply deregulation at a more micro level, the requirements for type certification of a new aircraft, for example.

[2] An interesting aside, but beyond the scope of this article, is that while medical technology has not, to date, been a general enabling technology as defined above, genetic technology clearly will be, and will be entering its own Stage II and will present similar social-policy issues.

THE TECHNOLOGY	PHASE I DEVELOPMENT AND EXPERIMENTATION	PHASE II ACCESS, EQUITY, & GOVERNMENT INVOLVEMENT	PHASE III REDUCED INVOLVEMENT AND DEREGULATION
RAILROADS	1830-1850 DEVELOPMENT OF TECHNOLOGY (the standard American type locomotive) 1850-1871 GOVT POLICY OF LAND GRANTS TO AID DEVELOPMENT 1880s GREATEST MILEAGE GROWTH EVER; STANDARDIZATION OF TRACK GAUGE, CAR COUPLERS, ETC 1883 GENERAL TIME CONVENTION	1876--GRANGER LAWS (states decree rates by law) 1874-1885--30 measures introduced in Congress, regulating interstate RRs. 1887--INTERSTATE COMMERCE ACT (creates Interstate commerce Commission; provides for rates to be "reasonable and just"; no discriminatory practices, no pooling agreements) BUT; no enforcement; ICC largely ineffective 1903-- ELKINS ANTI-REBATE ACT (no special rates to favored customers; no change of published rates; provides for enforcement of law) 1920-- MANN-ELKINS ACT (extends ICC's authority over cable, phone, & telegraph companies; empowered to suspend a general rate increase for 10 months until reviewed; creates a court to review ICC's decisions) Abolished in 1912. LaFollette tries to enforce fixed rates, but he's not successful.	1858--TRANSPORTATION ACT (Regulatory requirements are relaxed)
TELEPHONE	1876-- GRAHAM BELL INVENTS AND PATENTS A WORKING PROTOTYPE OF THE TELEPHONE 1880s-- the Bell System emerges as the dominant enterprise ever since 1876- 1893-- Bell patent monopoly: fixes prices and controls market.	1893-- monopoly ends when Bell patent expires. Entry of independent companies. 1893-1907-- as an effect of competition, rates go down, the number of phones increases from 260,000 to 6 million, and Bell's market share goes from 100 to 51%. In response, Bell refuses to interconnect with competitors. In 1907 Bell become more accommodating toward competition and accepts the stabilizing effects of ICC. 1910--MANN-ELKINS ACT gives the ICC power to regulate telephone and telegraph as well, WHICH Bell approves of. With growth of regulation Bell increases its market share.	1968--Carterfone Inc. files complaint with FCC, which issues decision allowing private users to purchase equipment from businesses other than ATT 1974--The Justice Department files an antitrust suit against ATT 1982-- MFJ, Modified Final Judgement. The antitrust suit is settled with the break-up of ATT

FIG. 1. The stages of previous general enabling technologies.

This disconnect, this tension, leads to, and helps explain, some interesting paradoxes. Most obviously, there is the apparent paradox that it is precisely those members of Congress who are most ardently promoting less government and more deregulation, who are also promoting the regulation of the Internet. It is at a superficial level apparently internally inconsistent, of course, but it is also quite understandable when viewed as deriving from a perception that the world at large is in Stage III, accompanied by an intuitive understanding that the Net is at Stage II.

More subtly, there is the paradox of a role reversal in

DYNAMO AND ELECTRIC DISTRIBUTION	Technological developments related to electricity span several centuries and countries. The dynamo is invented in Berlin in 1867 by Willelm and Werner Siemens. In the US: electric power industry's beginnings are marked by Thomas Edison's and Joseph Swan's invention of the carbon filament incandescent lamp in 1880, which spurs mass production of electricity. 1882--Pearl Street steam electric station in NYC; and in same year, first hydroelectric power plant opens at Appleton, Wis. 1880s--spread of power plants and new invention (Westinghouse's transformer in 1887) 1903--largest steam turbine-generator installed at a power plant in Chicago; from now on this will be the prime standard mover in electricity production.	1935--RURAL ELECTRIFICATION ADMINISTRATION. REA supplied electricity to a whole variety of settings, rural and urban, small and large businesses, and especially defense after 1940. The Federal Power Commission regulated interstate electricity	1970s--Wind farm laws
COMMERCIAL AVIATION	1903--first controlled flight by Wright post WWI--commercial aviation starts 1919--the Post Office establishes regular government airmail service 1920--first regular commercial passenger air service, between Florida and Cuba; 1925--the government starts letting contracts for airmail service to commercial private bidders; 1925--first domestic scheduled passenger service and first freight service. 1926--AIR COMMERCE ACT; the government assumes responsibility for safety regulations, aids to navigation, and development of airways. This promotes the expansion of commercial private air transportation.	1938--CIVIL AERONAUTICS ACT; establishes a board with the power to regulate conditions of routes, fares, and of entry and exit in air transport industry; the governments owns and operates the airways; private businesses own commercial airlines subject to control of the board (CAB)	1978-- AIRLINE DEREGULATION ACT; ended forty years of federal protection. By 1980 airlines had total freedom to set fares and routes.

FIG. 1. (Continued)

comparison to previous technologies. This arises out of our first amendment concerns. As Ithiel de Sola Pool (1983) pointed out in his *Technologies of Freedom*, we must be on guard as to how to prevent erosion of our first amendment rights, crafted in an age of print-on-paper technology where anyone with a press could print a broadside, as we transit to the electronic age with its tradition of government allocation and regulation of electronic communications based on perceived spectrum scarcity. With previous enabling technologies, it has been the liberals who have introduced Stage II and called for regulation to ensure equity and access. With the Net however, the

	PHASE I DEVELOPMENT AND EXPERIMENTATION	PHASE II ACCESS, EQUITY, & GOVERNMENT INVOLVEMENT	PHASE III REDUCED INVOLVEMENT AND DEREGULATION
NETWORK (INTERNET)	1965/66--DIALOG developed; become a public service in 1972 1967--OCLC is founded 1969--a packet switched network links four ARPA sites (military) 1973--TCP/IP released 1986--NSFNET, established by National Science Foundation, serves as backbone for civilian network that will become Internet	1996--TELECOMMUNICATIONS BILL	

FIG. 2. The stages of the 'Net'.

liberals are concerned with the preservation of first amendment rights. They take their cue from Justice ''no law means no law'' Douglas, concluding that the most direct and straightforward way to preserve first amendment rights is to oppose any regulation of the Net, particularly any regulation of content. This time it is the conservatives who are launching Stage II initiatives.

This perception of the societal Stage III/Net Stage II disconnect leads to some interesting ramifications and fascinating questions:

- How valid is the analogy? How well will it hold? With the exponential rate of growth of the Internet, could we not simultaneously be in Stage II and Stage III of the Net?
- How long will Stage II of the Internet last? Stage I was transited remarkably briefly, or was it? We may be victims of too much hype about the warp speed of change and the Internet's exponential growth. If we view the Net phenomenon as the online network, not just the Internet, Stage I goes back to at least 1965 and Lockheed's and SDC's developmental work in networked online search systems for NASA (the U.S. National Aeronautics and Space Administration) and the National Library of Medicine, respectively. In 1971, real operational impacts were felt when the National Library of Medicine launched Medline, and the Online

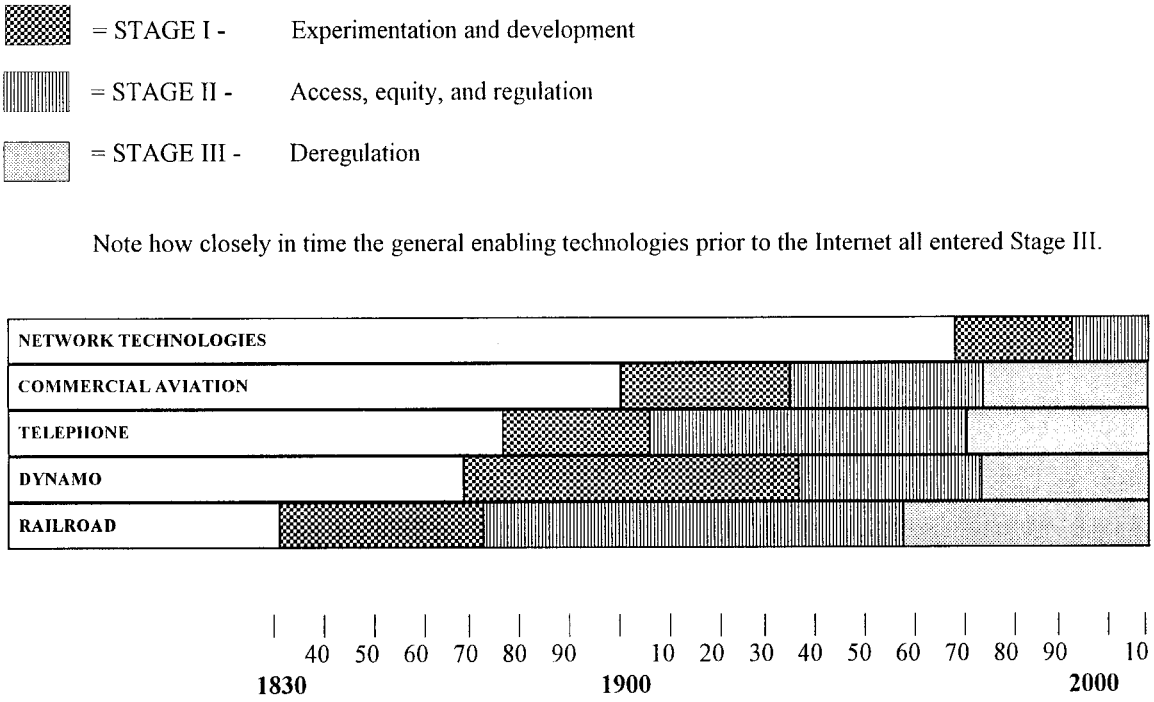

FIG. 3. General enabling technologies and Regulation: A timeline.

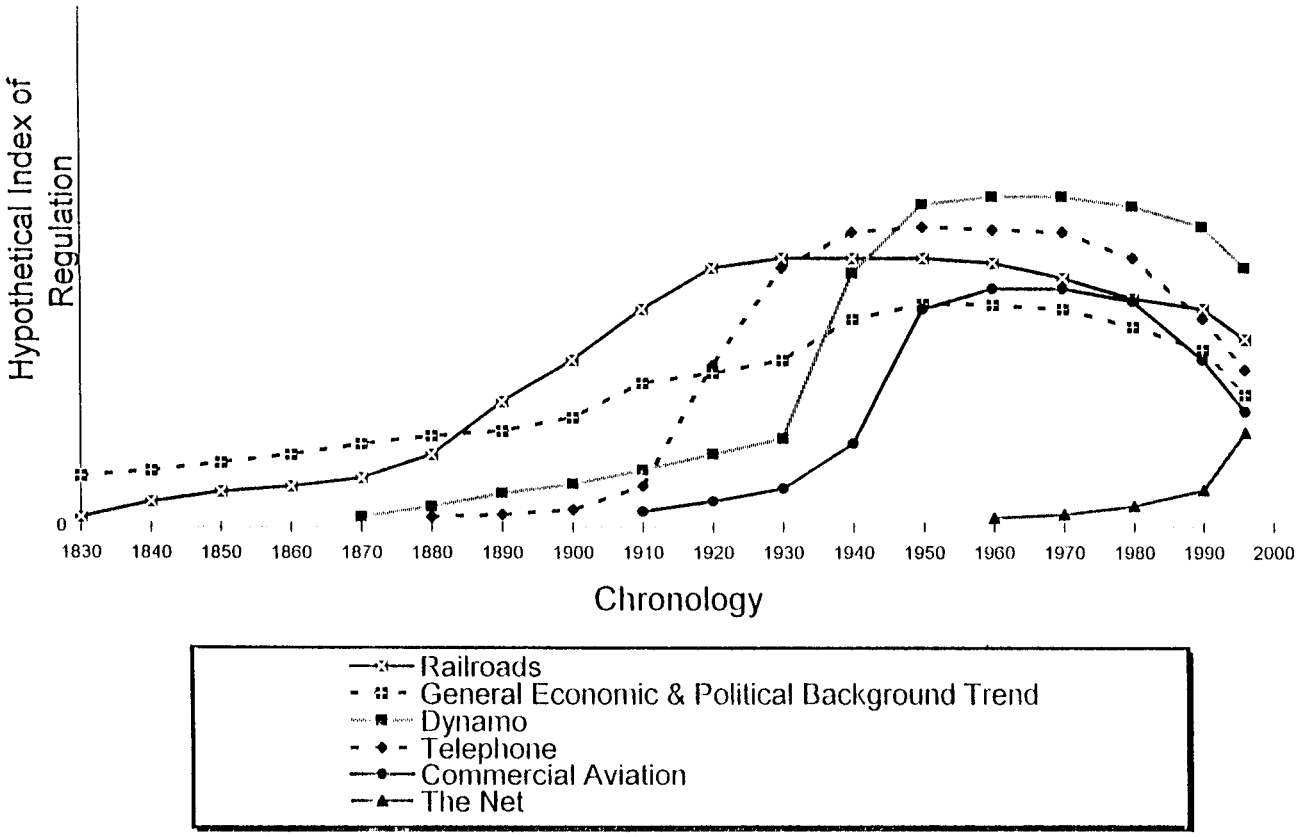

FIG. 4. Life cycles of major general enabling technologies.

Computer Library Center (then the Ohio College Library Center) launched its online library cataloging system. This was followed shortly, in 1972, when both Systems Development Corporation and Lockheed Corporation launched their commercial online database search systems, Orbit and Dialog, respectively, both based on proprietary systems that originated in the mid-1960s (Bellardo & Bourne, in press; Koenig, 1992). The Internet itself can be traced back through Arpanet to 1969. In that light, Stage I of the Net has lasted more than a quarter of a century, not dramatically less than the Stage I of the railroad, or the telephone, or the dynamo, and about comparable with commercial aviation. Viewed in that fashion, the Net is not, in a chronological sense, behaving noticeably differently than previous general enabling technologies.

- If the Net is as important as we may think it is, so important that it may soon drive the tone of society, have we seen, perhaps at President Clinton's ''State of the Union'' message, the high-water mark of the deregulatory era and the deregulatory mind-set? Or to state the thought more cautiously, have we seen, at least, a high-tide mark in a cycle that is measured in decades?

These are interesting questions to reflect upon. If we understand where we are in the life cycle or developmental stage of a technology, we are more likely to avoid technical miscues such as the development of the RLIN (Research Libraries Information Network) system, which, as Koenig (1987) pointed out, proved to be operationally totally superfluous.

Probably the most important reflection is that there is a Stage II to general enabling technologies, and that the Net has just entered its Stage II, and that, furthermore, society does have legitimate concerns about access, fairness, and equity, muddied as they may be to our eyes at least, with concerns about cyberporn, and censorship, and the preservation of first amendment rights. A knee-jerk negative (''information yearns to be free'') reaction to Stage II phenomenon is not likely to be very constructive. There will be regulation; that much is clear. The Net community must distinguish and disambiguate the various issues and have specific, constructive, and reasoned responses to those issues. The realization that the Net is at a different stage in its life cycle than is most of the rest of society's concerns, and that the stage into which the Net is entering is one characterized by legitimate societal concern for the regulation of issues of access and equity, can help in articulating and constructing those targeted responses which these complex issues deserve.

The more clearly we recognize that the Net is at Stage

II, then the more effectively and expeditiously we should be able to transit Stage II, with a minimum of pernicious side effects, and arrive at societal consensus and a stage of maturity for the Net.

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