The IT Revolution, Networking, and the "Flying-Geese" Paradigm of Structural Upgrading

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Abstract

This paper explores the implications of the information technology (IT) revolution (e.g., E-commerce) to MNEs' activities and structural changes in terms of the "flying-geese" paradigm of growth. What may be called the "McLuhan" stage of growth (New Economy) is added to the Old Economy progression of "Heckscher-Ohlin," "nondifferentiated Smithian," "differentiated Smithian," and "Schumpeterian" industries. How each tier of industries is impacted by the IT revolution and how a new division of labor is created via online (Web) inter-firm networks and strategic alliances are examined.

Key words: Information technology. New inter-firm networking. Structural upgrading. "Flying-geese" paradigm

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1. Introduction

The global economy is now in the grip of the information technology (IT) revolution, a technological and organizational revolution that has been unleashed and so far has most successfully taken root in the United States over the last three decades--but at accelerating pace especially during the last decade. It is the driving force of so-called a "New Economy". The recent phenomenal rise in U.S. productivity, for instance, is ascribed to the application of information technologies. Indeed, we can paraphrasing Adam Smith's famous maxim: "the division of labor is limited by the extent of the application of ITs."

This paper considers the implications of the IT revolution to structural changes within the analytical framework of the reformulated "flying-geese" paradigm of structural change. This stages (leading-sector) model depicts the general development path of a catching-up economy through cross-border *learning and technological absorption* by capitalizing on existing industrial knowledge and the availability of *markets* (i.e., demand or purchasing power) in the advanced countries. In this process, no doubt, multinational corporations from both advanced and developing countries play the crucial roles of both *facilitators of learning* and *providers of market access*.

Thanks to the development of information technologies, knowledge ("intellectual capital" as opposed to "natural capital" and "physical capital") has finally become *the* decisive input in economic activity.[1] The origin of the IT revolution is normally traced back to the invention of the transistor, which ushered the world into the age of information. The transistor rapidly

developed into ever- more powerful and sophisticated chips with declining costs of production through the dynamic learning curve. These microchips soon found their ways into personal computers (PCs), desktops, laptops, and most recently palm-held devices–all more powerful, more efficient, and more user-friendly in the aggregate than the mainframe computers which were once considered to be the major player in the world of computers.

In the meantime, telecommunications began to shift from analog (electro-mechanical) to digital switching (computer-controlled and programmable exchanges), which is the nerve center of the telephone system, along with the use of fiber-optic cables for transmission. Telecom satellites, along with the global positioning system (GPS), and mobile phones came to serve as substitutes for fixed-line phone services. These technological developments have vastly improved efficiency in telecommunications. But perhaps the most important watershed event was the birth of the *Internet*, which was able to connect and integrate all the past information-related technological achievements, both artifacts and services, in one useful media package and spawn a new variety of information industries. And we were suddenly in the age of the New Economy or the Internet World, now that the information industry has finally come of age.

2. The flying-geese paradigm of structural upgrading

How should we appraise the IT revolution in terms of historical stages of economic growth? This revolution is often hyped as a "third Industrial Revolution," the first being the "Industrial Revolution" (mainly of the early 19th century originated in England) represented by the innovation of the steam engine and the second being the one delineated by the internal combustion engine and electricity. It is, however, still too early to assess the full impact of information technologies on economic activities, since this revolution is in the midst of progress

without yet revealing all its potential effects and ramifications.

It is clear that the IT revolution has something to do with *information* (intangibles)–quite different in nature from the steam engine, the internal combustion engine, and electric power. It also basically has to do with *inter-agent relationships as a system* –not with certain new individual goods or energy sources *per se.* Since information technologies are impacting the multifarious webs of transactions among billions of economic agents within and among countries, the world economy is changing in some fundamental ways.

Many different patterns of economic growth have been identified.[2] For example, Clark (1935) introduced an inter-sectoral progression (primary->secondary–>tertiary) of compositional changes over time. Rostow (196) mapped the path of growth in terms of "preconditions –> takeoff–>sustained growth–>high mass consumption." Clark's model which predicts the rising importance of the tertiary sector (services) at high levels of growth is quite pertinent to the IT revolution, since information technologies enhance the quality and efficiencies of services (intangibles) related to economic transactional exchanges in particular. Rostow's stage of "high mass consumption" is equally significant, since the IT revolution is essentially geared to the enhancement of customer/consumer satisfaction. E-commerce (now increasingly M-commerce as well) is its manifestation. At the moment, the Internet is most oriented to, and focused on, customers.[3]

In this short paper, however, a so-called "flying-geese"(FG) paradigm of growth and structural change (originated in Akamatsu 1935, 1962; expanded in Kojima 1958, 1995; and reformulated in Ozawa 1992 , 2000) will be used as a framework for analysis to explore the implications of the IT revolution to structural changes in the economy.

This stages paradigm of structural upgrading envisages the following four tiers/stages of manufacturing in an open economy: (i) Labor-driven industrialization (involving the "Heckscher-Ohlin" industries such as textiles, toys, and sundries); (ii) resource-intensive, scale-driven heavy and chemical industrialization (involving the "non-differentiated Smithian" industries such as steel, basic chemicals, and heavy machinery); (iii) components-intensive, assembly-driven manufacturing ("differentiated Smithian" industries such as automobiles and electronics); and (iv) R&D-driven, high-tech manufacturing ("Schumpeterian" industries such as new materials, mechatronics, and biotechnology) (Ozawa, 1993). Since these four ties of leading industries have appeared in successive waves, a pattern similar to a flying formation of wild geese, their sequential growth is thus in line with a FG paradigm.

Be that as it may, as an economy advances, it ends up having a *hierarchy of industries* with the "Schumpeterian" industries at the top as tier 1, the "Heckscher-Ohlin" industries at the bottom as tier IV, and the other two ("non-differentiated Smithian" and "differentiated Smithian" industries as tier III and tier II in that order) as intermediate tiers. The sequential upgrading of industries as above described traces the development of industries, an industrial path that the presently advanced world has created and climbed over the past two centuries or so. The sequence depicts a *linear* progression of new industries appearing as a stage-specific dominant sector at intervals.

What then comes after the "Schumpeterian" industries as the leading sector? Where should we place the information industry? How should we assess the impact of the IT revolution on the sequential process of structural upgrading, namely on this *hierarchy of industries*?

The Internet economy or New Economy does not fit into any of these four tiers, since it has

emerged just only recently. Hence a new stage needs to be added to the previous sequence of H-O, Smithian, and Schumpeterian industries. Here I propose what may be called "McLuhan"[4] (after Marshall McLuhan) stage to represent the new information (Internet) industry, which is actually an Internet-driven integrative outgrowth of both tier II and tier I (differentiated Smithian and Schumpeterian) where computers, peripherals, and software programs were introduced, as illustrated in Chart 1.

The McLuhan information industries are a new huge *media complex* composed of telecommunications companies such as AT&T, British Telecoms, Deutsche Telekom AG, Vodafone, etc. as *upstream* operators, and portal providers such as Yahoo and America Online as *midstream* operators, and E-commerce (dot com) companies such as Amazon.com, Ebay, Priceline, and hundreds of other online firms, as *downstream* operators. What they produce are *"information goods*" (interchangeably called "*abstract goods*" or "*conceptual goods*"[5]).

Some key features of McLuhan and Schumpeterian industries can be differentiated and contrasted as follows :

Chart 1 The IT Revolution (New Economy) and Stages of Growth:
The "Flying-Geese" (Leading-Sector) Model of Structural Change

	Old Economy		New Economy	
Stages				
1. "**Hekscscher-Ohlin**" stage: Labor-intensive, industries (e.g. **textiles, apparel**, **sundries**)	2. "**Non-differentiated Smithian**" stage: Scale-based, resource-intensive goods (e.g., **steel**, **chemicals/synthetics**, **heavy machinery, ships**)	3. "**Differentiated Smithian**" stage: Scope/scale economies-based, assembly-intensive goods (e.g., **cars**, **TV sets**, **electronics**)	4. "**Schumpeterian**" stage: R&D-based goods (e.g., **new drugs**, **bio-technology**, **new materials, opto-electronics**)	5. "**McLuhan**" stage Information-analyzing. transaction-facilitating, "virtuous space/market" creating industries (e.g., **Internet services**, **online markets: information**, **images**)
Market Structure				
Highly competitive: small& medium-businesses	Oligopolistic: (industrial groups)	Oligopolistic in final assembly and key components but highly competitive in parts & accessories	Oligopolistic: centralized/ formalized R&D (division between knowledge workers & production workers)	Oligopolistic in telecoms, portals & B2B but highly fluid/ competitive in dot.coms (B2C). Less formal R&D-based, (fusion between knowledge & production)
Government Role				
Export promotion	"Infant-industry" protection "Import protection as export promotion"		Science & technology policy	Leadership, deregulation, business restructuring Capital markets development

• Excepting telecommunications, the McLuhan industries (in particular downstream operators such as dotcoms) are not as much R&D-intensive as the Schumpeterian industries which produce new "physical goods" such as new materials, new drugs, and new microchips. The former do not require such huge research expenditures in developing new services as in Schumpeterian industries. It has no need for the formal research laboratories equipped with a variety of physical research equipment. What is needed is *imaginations and ideas*–and computer knowledge possessed by talented individuals. It should be noted, however, that the initial hardware of information technologies took the form of microchips and computers in the crevices of tier 1 (R&D-based) and tier 2 (assembly-based) industries, information artifacts which are indispensable tools of the IT revolution. In other words, the Schumpeterian industries are basically input providers to the McLuhan stage of growth just as the non-differentiated Smithian industries (e.g., steel and plastics) are to the differentiated Smithian industries (e.g., automobiles and TV sets).

• This new stage of growth is currently being created by the ongoing convergence of information technologies into a coherent whole (system). But unlike the previous *linear* and *sector-differentiating* progression of structural upgrading in which some new industries (say, automobiles) become dominant as a leading sector in the economy without much affecting yesteryear's leading sector (say, textiles), the McLuhan industries impact all the "older generation" (Old Economy) industries, especially in procurement and distribution activities. In fact, the non-manufacturing sectors such as finance, telecommunications, distribution, and government services will be most dramatically impacted. In this respect, the IT revolution seeps through and permeates the entire economy. It makes industrial boundaries "blurred." Old

Economy industries have to adjust themselves by adopting information technologies to be *connected* or "wired" with the emerging New Economy through the Internet. Fundamentally, the information industry now plays the role of a leading sector pulling up the rest of industries in the economy.

In what follows, we will examine how the IT revolution is affecting each tier of industries in the context of globalization, starting with the Heckscher-Ohlin industries:

2.1. Heckscher-Ohlin industries:

For many developing countries that pursue outer-oriented (export-driven) development strategies in their early stages of industrialization, the IT revolution will promote further integration with the outside world, especially with the advanced countries' markets.

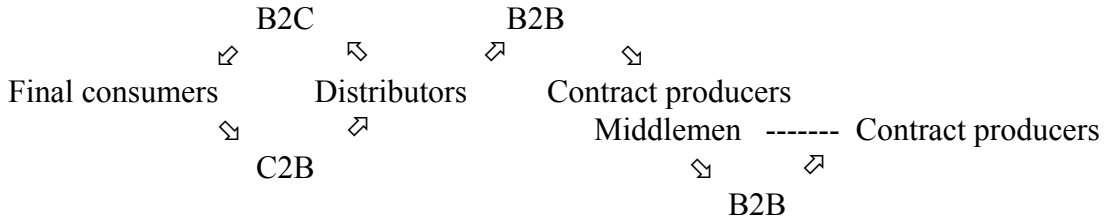
In this age of globalization, developing countries are eager to attract foreign MNEs which can make the best use of their most abundant factor, labor. Especially, highly consumer-oriented MNEs in retailing (such as Gap, Nike, etc.) from the advanced countries are setting up online procurement networks to promote information flows and reduce transaction costs. Their activities are intensifying labor-driven exports and industrialization in low-wage host countries. The end result is a rapid rise in local wages (as predicated by the Heckscher-Ohlin theory of trade) and a further shift in production to other developing countries where labor is still abundant and wages low.

In this connection, Taiwan's experience is illustrative. Many garment producers in Taiwan, which used to manufacture such labor-intensive products themselves when the wages were once low have metamorphosed from producers into procurement agents for Western distributors (Gereffi and Pan, 1994). This has resulted in "comparative advantage recycling" (Ozawa, 1993),

a recycling of comparative advantage in garments and textiles from Taiwan to other locations such as China and Vietnam. Consequently, trade has also become multi-layered or more circular, involving "triangle manufacturing."

Online international procurement networks (B2B2B in the context of triangle manufacturing) will certainly make comparative-advantage recycling even much faster and more efficient. U.S. import quotas accelerate the recycling of comparative advantage from one host to another, to take advantage of (avoid the quota restrictions on individual countries). In the advanced countries' import markets the Internet is improving the distribution of goods to final consumers through the B2C networks–and the feedback of any changing tastes/demand conditions and consumption behavior through the reverse B2C networks. Entry will be made easier for small-sized producers, thereby inviting a much larger number of potential contract producers per middleman–and many more potential contract producers and middlemen per distributor in the final market (Chart 2).

Chart 2 MNCs' chain of procurement and marketing via the Internet



To the extent that labor-driven industrialization is accelerated through online transactions, wages rise faster in a particular host economy, undermining its initial comparative advantage. This forces distributional MNEs to search a new low-wage location somewhere else. Thus, we can posit that *The IT revolution will accelerate the pace of comparative advantage recycling in labor-intensive manufactures from one host to still- less-developed host countries or a host region down the hierarchy of countries*.

What is perhaps more important, *the IT revolution makes labor-intensive services into tradables*. Since labor migration across borders is restricted, unlike exportable labor-intensive manufactures, service trade used to be limited largely to tourism. Information technologies all of a sudden created an undreamed-of opportunity for indirectly exporting labor services. Companies in high-cost Europe and U.S. are turning to relatively low-cost skilled workers in English-speaking host countries such as Ireland, India, the Philippines, and Caribbean nations; according to the Business Week (August 28, 2000), the next 10 to 15 years may see as many as 90% of today's American white-collar and clerical jobs outsourced to relatively labor-abundant host countries.[6]

In addition to the language factor, *demography* may be another key determinant. On the whole, young people–or what I call a "video-game generation"--are much faster in learning, and more comfortable with, information techniques. Mature advanced economies are usually handicapped by the aging population. Hence, a great deal of service work will be outsourced over the Internet to developing countries. Some call this "virtual migration" (Rand, 2000).

We can conclude that *the Internet-assisted exports of labor services are today's equivalent of yesteryear's textile exports, and the same "Heckscher-Ohlin (Stolper-Samuelson) factor-price*

magnification (trade-induced wage hike)" effect is equally observable (which is actually the vital mechanism to compel the developing host economy to move up the ladder of industrialization). The new round of labor-driven economic development is thus in the making.

2.2. Non-differentiated Smithian industries:

"Non-differentiated Smithian, " scale-driven, resource-intensive industries (such as steel, basic chemicals, and cement) are made increasingly more conscious about, and eager to cater to, the needs of customers by the IT revolution. A case in point is most vividly illustrated by the recent experience of Mexico's Cemex, the world's third-largest cement company after Holderbank of Switzerland and Lafarge of France:

> Cemex's biggest problem in an asset-intensive, low-efficiency business was unpredictable demand. Roughly half of its orders were changed by customers, often just hours before delivery. Dispatchers took orders for 8,000 grades of mixed concrete and forwarded them to six plants. The phones were often jammed with calls from customers, truckers, and dispatchers, resulting in lost orders and frustrated customers.
>
> Then Cemex went digital, vastly reducing delivery and production problems. . ... For starters, [management] linked the company's delivery trucks to a global positioning satellite system so dispatchers could monitor the location, direction, and speed of every vehicle. That means Cemex can quickly send the right truck to pick up and deliver a specific grade of cement, or reroute trucks around congested traffic, or redirect deliveries as last-minute change occur. It reduced average delivery times from three hours to 20 minutes. [Management] reaped huge savings in fuel, maintenance, and payroll, since Cemex now uses 35% fewer trucks to deliver the same amount of cement. And because it can guarantee delivery of a perishable commodity product within minutes of an order, it can charge a premium for it.... ("Management by Web," *Business Week*, August 28, 2000, pp. 93-94).

By way of information technologies, heavy and chemical industries can thus focus on the distribution of bulky, traditional/mundane yet often customized products under a "real-time" delivery system.

2.3. Differentiated Smithian industries:

Differentiated Smithian industries are intensive in the use of parts, components, and accessories. Key parts and components (say, engines and chassis in the automobile industry) are normally either produced in-house or procured from closely affiliated suppliers because of their "asset specificity" nature. Relational transactions thus exist on a long-term basis. But most of other inputs are procured from independent suppliers under the "just-in-time" delivery system. Given the already developed networks of assembler-supplier relationships, no wonder that online connections through the Internet (B2B) are developing rapidly in assembly-based industries, facilitating procurement. For example, the U.S. Federal Trade Commission has recently approved the establishment of a huge online B2B marketplace for parts, called Covisint, by the Big three automakers, GM, Ford, and DaimlerChrysler, which together make an annual purchase of as much as $300 billion.. Nissan of Japan and Renault of France are also parties to the exchange, and Toyota of Japan is reportedly negotiating. The FTC is apparently satisfied with its judgement that there would be no danger of collusion or other anticompetitive activity and that the new Internet venture would result in huge cost savings, improved communication, and faster product development.

In fact, the component-intensive, hence procurement-dependent industries are expected to gain most from the *multinational* B2B markets. One study estimates that firms' possible savings from purchasing online vary from 2 percent in the coal industry (i.e., Heckscher-Ohlin type) to up to 40 percent in electronic components (i.e., differentiated Smithian industries).[7]

In other words, *the more procurement-dependent an industry is, the greater the benefit of the Internet. MNEs' operations lead to multinatinal/global B2B markets.*

In addition, since the differentiated Smithian industries, notably car makers, are consumer

(final user)-oriented compared to the nondifferentiated Smithian industries which are engaged in producing capital goods and intermediate goods, *branded* mobile Web/Internet B2C services are increasingly being offered by top-line car makers, whereby customers can have all sorts of links to motels/hotels, road maps, traffic information, emergency services, and repair shops. (*Business Week*, Oct. 16, 2000).

2.4. Schumpeterian industries:

R&D-intensive Schumpeterian industries (e.g., biotechnology and new pharmaceuticals). The IT revolution is expected to enhance efficiencies by facilitating communications and information exchange in research activities. If we consider how the Internet was born, we can easily appreciate its significant impact on R&D-driven industries. After all, the U.S. defense department "poured hundreds of millions of dollars into *network technology*, including the world's first large-scale network Arpanet, which began operating in 1970 as the forerunner to the Internet" (*Wall Street Journal*, Sept. 9, 1994). The mainframe computer is the center of a individual network, forming a highly centralized system. But such a system at a certain key research center is highly vulnerable to total destruction by an enemy attack. The Internet was designed and perfected as a military defense technology to form a dispersed but interconnected whole of separate individual networks of computers at several research centers so that destruction of one subsystem would not lead to any loss of vital information by making information constantly "mobile" instead of being confined to one particular location. At the same time, this "virtual" integration of the research community results in better exchanges of ideas and information to facilitate knowledge creation. Starting in the early 1990s, Internet technology began to be actively utilized as an infrastructure for commercial (civil) research-related

communication purposes.

The first leading company to use information technologies most extensively was Texas (Plano)-based Electronic Data Systems (EDS) Corp., the computer-services unit of GM, which developed the world's largest corporate data network in the mid-1990s, "linking 400, 000 desktop computers and terminals, 95 data centers housing 142 mainframes, and 15,000 satellite dishes in 30 countries," and having "the capacity to store 49.7 trillion pieces of data, 45 times the contents of the library of Congress" (*Wall Street Journal*, Sept. 9, 1994.)

There is a growing trend toward shifting R&D activities worldwide, especially to the centers of excellence where agglomeration economies in knowledge creation exist. Cantwell (1989; 1995) and Cantwell and Janne (1999), for example, observe that through international business operations, MNCs in a high-tech/R&D-based industry are not merely involved in technology transfers and knowledge spillovers but more importantly are increasingly engaged in new knowledge creation via a cross-border network of R&D facilities. By the very original nature of the Internet (that is, to connect and integrate separate networks of computers into a larger whole (an exchange for ideas) for faster communication and information flows and security among researchers), border-straddling knowledge production is all the more facilitated. What may be called a "R2R" (research-to-research) alliance web is undoubtedly on the rise.

In short, all the four existing tiers of industries are increasingly "wired" and connected with their customers, suppliers, business and research affiliates and partners. Research efficiencies are expected dramatically to improve thanks to the Internet. The emergence of the McLuhan industries as the present new leading sector represents not so much a structural shift along the traditional linear progression (along the ladder of industries) but rather a structural upgrading of

the entire hierarchical structure of industries. To use Pearce and Papanastassiou's distinction between two types of restructuring (1996), the IT revolution is exerting a much stronger "intraindustry restructuring" effect than an "interindustry restructuring" on the FG pattern of structural upgrading.

3. Enabling factors and infrastructural requirements for the "McLuhan" stage

As briefly sketched out in Chart 1, each tier of industry is supported by different market structures and infrastructural services. Unlike the previous stages of economic growth, the "McLuhan" industry requires a proportionately large dose of "intellectual capital, " that is, knowledge which is accumulated/stored in human brains, documents, computer discs, and any other knowledge/information storage facilities—and more importantly, ideas which are created by human imagination and inspiration . In this respect, "McLuhan" goods are *high-knowledge goods*. These characteristics are in sharp contrast with the bottom-tier "Heckscher-Ohlin" industries that uses "natural capital" (raw labor and natural resources) most intensively and "physical capital" (such as a transportation system) as a support.

How fast and successfully the IT revolution can occur in an economy depends on three groups of key variables: (i) hard infrastructure, per capita income, and leadership, especially at the initial phase of the IT revolution, (ii) institutional factors and language (English vs. non-English) at the intermediate stages, and (iii) cultural factors at advanced stages (Rand, 2000).

- Hard infrastructure essentially means information *artifacts* (such as telecommunications facilities and equipment, computers, mobile phones, etc.) which can be easily acquired through imports if they are not produced at home. Both demand for and supply of information are a direct function of per capita incomes. Leadership and enthusiasm at state, corporate, and

individual levels are particularly crucial in launching the IT revolution.

•Institutional factors such as regulations, legal framework, and education system influence the adoption and outcome of information technologies. English is currently the most important language of the Internet world (as seen earlier), since so much of online information is provided in English).

• Homogenous culture vs. stratified culture, vertical authority relationships, meritocracy, trust, individualism vs. collectivism all influence the spread of the IT revolutions.

4. Financial dimension

One of the most impacted industries by the IT revolution is finance, which deals with intangible assets (money, credit, derivatives, risk coverage, speculation, etc.) and whose transactions are highly information-intensive, as well as information-sensitive. These characteristics are amenable to the application of information technologies. All-Internet (online) banks are now appearing to compete with traditional fixed-location banks.

In addition to the fact that information technology drastically alters the nature of financial businesses, finance itself is the vital part of the New Economy. Technological progress itself– hence Internet-driven economic growth-- is now so closely tied to capital markets more than ever before. The U.S. economy has been in the lucky loop/ virtuous circle of "information-related innovations->productivity gains->stock market gains->increased wealth->consumption and investment->productivity gains->increased wealth->more information-related innovations-> IPOs->increased wealth, "resulting from the synergistic interactions between the real economy and wealth creation. Michael Mandel (2000) succinctly captures the essence of this synergy: "if technology is the engine for the New Economy, then finance is the fuel."

Since the McLuhan stage being so new and having occurred first in the United States, a *unique* New Economy model of growth *specific to* the prevailing conditions in the U.S. has evolved to take its present form. This *modus operandi* can be summed up as what I characterize as a "quadri-layer dependence on capital markets:"

- At intra-firm (micro-micro) level, information workers at startups can no longer be considered costs but assets. They provide intellectual capital in exchange for stock options–that is, they are *knowledge creators* themselves and *investors* in–financiers of--their own knowledge. Workers themselves are capitalists. For this incentive system to work, vigorous stock markets are the *sine qua none* for healthy investment returns;

- At firm level, Internet startups need venture capital and successful IPOs to finance corporate growth–hence, a heavy reliance on capital market;.

- At economy level, as described above, the lucky loop of synergy between the real economy (innovations, productivity growth, and high employment) and capital markets (stock market gains) is at work;

- At supra-national level, U.S. capital markets have been supported by huge inflows of money from overseas (i.e., capital account surplus), which is accompanied with an equally huge deficit on the current account.

Some consider this U.S.-style model of a New Economy structurally unstable and untenable in the long run. Three weaknesses stand out. First, an income gap widens between knowledge workers and run-of-the-mill workers. Second, the U.S. economy is vulnerable to a sudden reversal of capital flows . Third, "the Old Economy business cycle, led by housing and autos, is being replaced by the New Economy tech cycle, driven by financial markets," and the latter's

downturn may be deeper and more pervasive than its Old Economy counterpart (Mandel 2000). Indeed, other countries, in particular the EU and Japan, are in a serious quandary as to whether to adopt the U.S. model or to create whatever new model suitable for their own socio-economic needs.

5. Summing Up

The IT revolution is now upon us. It has introduced a New Economy to challenge the Old Economy and its institutional setup. How the IT revolution exerts wide-ranging repercussions to the entire economy and its growth path is a critical issue that needs to be examined. This paper takes a first crack at the issue in terms of the reformulated FG paradigm of structural change by framing a newly emerged tier of industries as the McLuhan stage of growth. Within this framework, the arrival of the information industry can thus be depicted as today's leading sector whose *modus operandi* encompasses both the real economy and the financial world and exploits their inter-sectoral synergies, as is reflected in the current U.S. prosperity driven by Internet-based innovations.

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Endnotes

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1. "The economic impact of the Internet has often been described as an oil shock in reverse. The jump in the oil price in the 1970s increased inflation and pushed the world into recession. The Internet reduces the cost of another input, information, and so has positive economic effects" ("Internet Economics: A thinkers' guide," *Economist*, April 1, 2000, p. 64).

2. For an excellent historical review of stages theories of growth, see Rostow (1990).

3. It should be noted, however, that E-commerce (and for that matter, M-commerce) seems to be more hype than reality at the moment. "For all the feverish excitement about the tripling of electronic shopping last holiday season [1999], the total spent by American consumers online still amounted to only about 1% of all retail sales–barely a tenth of the revenues from another method of distance selling that has been in use for a century: the catalogue" ("E-Commerce: Shopping around the web," *Economist*, Feb. 26, 2000.)

4. This description is used, since Marshall McLuhan was among the first to recognize the arrival of the age of information. See, for example, McLuhan (1967, 1989). Unfortunately, economists have not yet given sufficient attention to the ICT revolution. No major work exists on the role of information as a revolutionary force in the economy.

5. The term "conceptual goods" is used by Alan Greenspan of the Federal Reserve, who has become a true believer in the New Economy (Greenspan, 2000).

6. "Countries where English–the language of global commerce and the Internet–is spoken will have the sharpest edge. That's why Ireland, where the economy is now growing at 7.5% annually, has enjoyed an astounding turning around in the last several years: Companies ranging from Citigroup to Microsoft were attracted by its pool of skilled English speakers, plus generous tax breaks offered by the government. Indeed, Ireland has become the world's leading software exporter" ("Different Countries, Adjoining Cubicles," *Business Week*, Aug. 28, 2000, pp. 182-3).

7. “British Telecom claims that procuring goods and services online will reduce the average cost of processing a transaction by 90% and reduce the direct costs of goods and services it purchases by 11% “ (“Internet Economics: A thinkers’ guide,” *Economist*, April 1, 2000, p. 65).