POLICY IMPLICATIONS OF THE NEW INFORMATION ECONOMY

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We can perhaps assume that the use of a medium of communication over a long period will to some extent determine the character of knowledge to be communicated and suggest that its persuasive influence will eventually lead to the emergence of a new civilization.

H.A. Innis, (1950) Empire and Communication

INTRODUCTION

An ever more popular theme in the scientific literature, government policy documents and the popular press, is that technologically advanced economies are in the process of moving beyond industrial capitalism to information-based economies. This transformation is expected to bring profound changes in the form and structure of economic, social, cultural and political systems. European Union (EU) integration and the North American Free Trade Agreement (NAFTA) are just two illustrations of this ongoing restructuring of economies and societies (Melody 1985; a).

This transformation is being driven by the development and pervasive application of information and communication technologies and services (ICTS). The electronics, computer, telecommunication, media and information content industries constitute a $US trillion-plus global industry sector. It is the fastest growing sector of the global economy and is expected to remain so for the foreseeable future. Most national governments are counting on these industries to provide the primary stimulus to their future economic growth.

If one were to believe the “blue sky” speculation and industry promotion about the technological and service possibilities in this field, one would quickly conclude the new ICTS will solve all of society’s problems. A more realistic assessment of the process of transformation to an information economy may provide a little deeper understanding and help fashion more realis-
tic policies by governments and market decisions by industries. (Melody 1996).

This chapter examines some characteristics of “information” in the new information economy, and the important policy issues and implications they raise. The term “information economy”, rather than the currently popular “knowledge economy” is selected deliberately because – as this chapter will demonstrate - it is not at all clear that an expansion of information in the economy will necessarily lead to an expansion of knowledge. This remains to be demonstrated and is likely to depend significantly on the development and application of effective government policies at both national and international levels. This chapter focuses on the common general characteristics of information economies, and does not take up the very important issues arising from the great differences among national economies. Hence the use of the generic term, “new information economy”.

**MAJOR FORCES DRIVING ECONOMIC TRANSFORMATION**

The primary forces driving the transformation of national, regional and global economies are dramatic changes in technologies, policies and markets - the combination of the development and increasingly pervasive applications of ICTS on the one hand, and the worldwide movement to market liberalization and deregulation on the other. The conversion of telecommunication (telecom) networks and all forms of communication and information content to digital standards is creating an electronic network foundation that facilitates exchanges and transactions of all kinds. Electronic commerce and the next generation Internet represent the next step in this process. Together with liberalized markets and reduced barriers to trade, this will ensure the 21st century information economy is primarily an international, or even global economy. (Sheehan and Tegart 1998).

In an agricultural economy, land is the most valuable resource attracting investment capital. In an industrial economy, manufacturing plants, machinery and other forms of physical capital are the focal point of investment activity. In the information economy, the expectation is that people will be the central resource attracting investment because information is essentially produced, stored and applied by humans. Whereas the industrial economy was an era of physical capital with labour employed to facilitate its needs, the information economy is expected be an era of human capital with investment in the skills, competences and capabilities of people being the central activity.

This suggests that the information economy can provide for a considerably higher level of human development than the industrial economy, for the conversion of what we know as the “labour force” into information or knowledge
workers, and for a significant expansion in investment in education, training, research and development – the major formal knowledge generating and distribution activities. It also suggests the possibility for a more widespread distribution of the wealth generated in the knowledge economy because the human resources attracting this increased investment are also workers and consumers.

Therefore, the most important elements of the new information economy that require examination are,

1) the increased generation and use of information as both an economic resource and a product exchanged in markets;
2) the development and use of advanced high speed telecom networks – the information infrastructure – for electronic commerce and related next generation Internet activities;
3) a much greater emphasis on the role of human capital as the principal producer, repository and disseminator of information;
4) continued major market deregulation at both national and international levels.

THE INFORMATION/COMMUNICATION FOUNDATION OF ECONOMIC INSTITUTIONS

The functioning of any economy or society depends upon information, and the efficient and effective communication of it among society's members. Information is generally interpreted as a 'stock' concept, a store of knowledge and values. Communication is a 'flow' concept, reflecting the process of transmission and exchange of information, knowledge and values, which itself creates information influencing knowledge and values. 'Information' and 'communication' provide different analytical perspectives on essentially the same phenomena. An examination of the information characteristics of any economy must focus on its communication characteristics. New communication networks are often the driving force behind the generation of vast quantities of information.

In the broadest sense, the social, cultural, political and economic institutions in any society are defined in terms of the characteristics of the shared information within and among those institutions. (Innis 1951). In the narrower economic sense, it has been recognized generally that the most important resource affecting the economic efficiency of any economy, industry, production process or household is information and its effective communication. Now that entire industries and major sectors of technologically advanced economies are devoted to information - the search for it, the creation of it, the manufacture, storage, classification, summarization, selection, editing, interpretation, hoarding, purchase, sale, and broadcast of it - the economic charac-
teristics of information are beginning to be recognized as an area in which precious little is known.

Yet it is apparent that the characteristics of information define the state of knowledge that underlies all economic and social systems. They affect, the nature of economic markets and the structure of industry. They affect the internal structure of organizations ranging from corporations to government agencies, political parties, universities, labour unions, libraries and volunteer groups. They affect the formation of social and cultural networks; the nature of work and leisure; the role and definition of education; the structure, content and effective control of the mass media; and the information environment through which public opinion is formed.

Equally significant is the fact that institutions also generate information for the external environment that is employed by organizations and individuals for decision-making. For any particular institutional structure in society, there will be an associated information and communication structure that will influence how that society functions. Some institutional structures will provide stronger incentives for the creation and diffusion of information than others. Moreover, the type and quality of information is likely to change as a result of changes in institutional structure. If institutional change is desired, it may be necessary to change the information structure as a prerequisite to, or as an essential aspect of, effective institutional change.

The importance of information flows and communication patterns to the establishment and maintenance of particular institutions has been understood since earliest times. Trade routes and communication links were deliberately designed to maintain centers of power and to overcome international comparative disadvantages. Britain still benefits substantially from its historically established communication links with its former colonies, long after the empire's formal demise. Universal telephone service was adopted as a policy objective in the US and other countries to encourage economic and social interaction within the country as a way of promoting national unity. The EU is attempting to foster a new European identity by promoting increased communication and information exchange as a basis for stimulating increased trade among its member countries and completing the single European market.(Innis 1950).

**SOME CHARACTERISTICS OF INFORMATION MARKETS**

In reality, of course, all societies have been information societies. The most significant change between technologically advanced societies and the oral tradition of the Greek city-state - still practised by some native cultures today - is not in the role of information in society, but in the way that information
processes are institutionalized. The dominant form of information creation and exchange has shifted from oral discourse flowing outside the bounds of formal market arrangements to the establishment of information generating, storage and transmission institutions, the commodification of information and its exchange through markets. Perhaps the most significant change is not the volume of information, but the structure, the distribution, the institutions, and the dependence on particular institutions. (Melody 1987).

Information is often regarded as something equivalent to a natural resource, a mother-lode of objective, unbiased facts to be sought out by diligent search. For example, this view underlies such concepts as 'freedom of the press' in Western democracies. Although the press has been recognized as having biases of its own that influence the direction of its search, the information that is found, and how it is interpreted, there is a classification of information that can be analysed usefully as having the characteristics of a primary resource, an information commons for society.

The stock of knowledge in society at any one time, that is, the skills and education of the populace, the detailed factual information relating to such things as the working of production processes, the interrelationships and interdependencies of different sectors of the economy etc., collectively represent a primary resource of society. The value of this stock of knowledge to society depends upon how pervasively it is spread throughout society, and upon the institutions for maintaining, replenishing and expanding the stock of knowledge, i.e., its education and training system, and research generating new knowledge. Economic and social benefits come in the form of improved decision-making of all kinds throughout the economy.

Once information has been generated, the cost of replicating it is very much lower than the cost of generating it in the initial instance. The consumption of information by one user does not destroy it, as occurs with almost all other resources and products. The information remains to be consumed by others, the only additional costs being those associated with bringing the same information and additional consumers of it together under conditions where it can be consumed, i.e., learned. And once a given level of penetration is reached, a multiplier effect comes into play with many types of information, as the information is spread throughout society by informal communication processes outside the formal processes of learning and training.

Hence, although the costs of adding to the stock of knowledge may be very great there are generally significant economies in distributing that information throughout society, and to other societies if the incentive exists to do so. The implications of this economic characteristic of relatively low cost replication of information can be extremely beneficial under some circumstances such as the spreading of knowledge throughout society, for example, information about AIDS. But it can create special problems and difficulties under
other circumstances, for example, for a smaller society attempting to protect its culture from being engulfed by the spread of information and values from a dominant neighbour.

Unfortunately, in the new age of information, much of the new information that is generated has its greatest economic value in scarcity rather than in widespread distribution. For example, information that has become important as a resource input to industrial, commercial and professional activities is specialized information sought to provide 'inside' or superior knowledge of the behaviour of consumers, suppliers, competitors, government decision-makers, etc. In essence, in imperfect economic markets, this inside information for private consumption strengthens the negotiation or market power position of the organizations or individuals that have access to it. Such information may or may not be costly to obtain, but its economic value clearly lies in its scarcity, that is, in the monopoly of information. Once such information becomes generally known to all interested parties, its economic value dissipates drastically.

Specialized information services for the private consumption of a restricted clientele are springing up almost daily. They range from special research studies of the details of international markets for transnational corporations to confidential assessments of the negotiating strength of a specific customer, competitor, trade union, or government. They include remote sensing satellite data identifying the detailed swimming patterns of schools of fish, and pinpointing the location of mineral resources and the progress of crop growth in distant countries. They include the DNA of specialized crops and even people in distant lands. In recent years there has been a significant increase in claims of intellectual property rights (IPR) over an ever increasing range of information, and even basic data that may have future economic value.

Many governments have taken steps to attempt to restrain the march of information IPR and markets into the details of people's personal lives and to regulate the conditions of access to certain kinds of data banks, for example, credit, medical and tax files. The pursuit, sale and use of information in accordance with the incentives of the marketplace clearly cannot be totally unrestricted. But the production characteristics of (1) the relatively high costs of establishing most databases and information services; and (2) the relatively low costs of extending the market for services already created; provide a powerful tendency toward centralization and monopoly on an international basis. Thus, competitive forces in many information markets are likely to be rather weak. This, in turn can be expected to raise important issues of national and international government policy relating to IPR and competition policy. The inherent conflict between maximizing prices in quasi-monopoly information markets and the social efficiency of societal distribution at marginal costs approaching zero will be a central issue in policy debates about information economy policies.
EXTENDING THE LIMITS OF MARKETS

The rapid rise of information markets is made possible primarily by the interaction of advances in computer and telecom technologies. Advances in the computer industry have pushed back the intensive limit of the potential information market by reducing the costs of generating more and more kinds of data. Advances in telecom have pushed back the extensive geographical limit to encompass national and global markets. However, it is important to distinguish the economic implications of the new technology facility systems that provide the infrastructure within which information is generated and processed, and over which it travels, that is, the hardware, and the information services themselves, that is, the information content that is provided over the facility systems.

What are the implications of markets without geographical limits, and an enormous expansion of information in the so-called information economy? The conventional economic theory of markets would suggest that more information and better communication can only improve the functional efficiency of markets. It should lead to expanded competition and an increased role for the market in allocating resources in society. More considered analysis, in light of the experience of the last quarter century, raises questions about this oversimplified analysis. In particular, it raises the possibility that improved information and communication networks may be fundamentally altering the structure of markets so that, at least in many instances, they function less efficiently and play a less significant role in allocating resources.

With respect to knowledge and understanding, it is not at all clear that the new ICTS have led to an improved condition. Studies of transnational corporations have shown that those corporations with the most sophisticated and complex decision-making systems employing enormous volumes of information make no better decisions than firms making similar decisions with less information. Studies have shown that stock brokers, with access to many more sources of information for their stock purchase and sale decisions, have made no better decisions in the stock market than individuals who have not had access to modern sophisticated information sources. In light of the great expansion of information, most corporations have reduced their planning horizons because their ability to forecast the future has substantially declined, despite all of this additional information. With substantially improved statistical data and descriptive information about the workings of the economy, our understanding of the economic system is not demonstrably better than it was in the 1950s. Are the new information and communication technologies introducing more complexity, instability and uncertainty into our economic and social systems than the increased information will permit us to understand and control?
Moreover, the benefits of these technologies are not likely to be distributed uniformly across markets. Certain segments of society are likely to be made poorer in both absolute and relative terms. These new technologies permit many markets to be extended to the international and global level. But it is the largest national and transnational corporations and government agencies that have the greatest need for, and the ability to take full advantage of, these new opportunities. For them the geographic boundaries of markets are extended globally, and their ability to administer and control global markets effectively from a central point is enhanced. These changes have been a significant factor in stimulating the wave of mergers and takeovers involving the largest transnational corporations in recent years. The diseconomies of size and scope provided by increasing administrative costs and reduced effectiveness of information processing and communication in very large organizations can be reduced substantially by the application of information and communication technologies.

The manner in which these technological developments are being implemented creates possibilities for creating significant barriers to entry for all but the largest firms, thereby accelerating tendencies toward concentration. In fact, in many industries smaller firms are likely to find themselves disadvantaged because of the new technological developments. For example, telecom systems in most countries are being redesigned to meet the technically sophisticated digital data requirements of high-volume, multiple-purpose, global users - integrated services digital networks, supplied over high speed broadband transmission lines. For traditional, simpler communication requirements, such as basic telephone services, the upgraded system will serve quite well, but at substantially increased cost to smaller users. Unless there is public policy intervention, the telecom options available to small, localized, and even regionalized businesses are not likely to reflect their unique needs. Rather, their range of choice among services and prices on the common telecom network is likely to be dictated by the global needs of the largest firms and government agencies. In similar fashion, the terms and conditions for access to many new data banks provide substantial benefit to high volume transnational corporations, but prohibitive cost to small domestic companies, particularly in developing countries. (Mansell and Wehn 1998).

In most major industries the new competition that has developed from the globalization of markets is intensified oligopolistic rivalry among transnational corporations. The firms that can now leap across market boundaries are already dominant firms in their respective product/service and geographical markets. Their entry has a major impact on the structure of the supply side of the market just entered, which stimulates a major strategic response from the established dominant firm(s). This is not dynamic competition responding to the invisible hand of market forces as assumed in economic theory, but rather a type of medieval market jousting, an oligopolistic rivalry for the control of market territory. The rivalry is directed to obtaining a long-run position of
market entrenchment and dominance in particular foreign national submarkets. (Schumpeter 1950).

In attempting to achieve these long-term dominant market positions, the transnational corporations are often assisted by governments of their respective host countries. Many governments adopt policies and positions that assist their respective transnational corporations, and even participate in international marketing. Thus the oligopolistic rivalry among transnational corporations involves a strong element of nationalism and direct government involvement on both the demand and supply sides of the market exchange.

Taken collectively, these changes introduce new elements of risk and uncertainty into the economic system. But the greater the geographic coverage of a transnational corporation, the more risk and uncertainty can be diversified, although not for the particular production locations dependent on them. Indeed, major structural imbalances in regional economic development have been documented in several countries.

Historically, the current revolution in telecom technologies can be compared in certain respects with the effect of the introduction of the telegraph upon the structure of markets in the last century. In a detailed study of these developments in the United States, Richard DuBoff (1983) concluded, 'the telegraph improved the functioning of markets and enhanced competition, but it simultaneously strengthened forces making for monopolization. Larger scale business operations, secrecy and control, and spatial concentration were all increased as a result of telegraphic communications’. DuBoff noted that ‘increasing market size helped ”empire builders” widen initial advantages which at first may have been modest.’

It is apparent that decision-making in our society at all levels - governmental, corporate and individual – is becoming increasingly dependent on highly complex information and communication systems. The information acquires value because the decision-making systems in society are being structured so as to be dependent upon highly specialized information delivered over complex, high-technology telecom networks. As the dependence becomes greater, the economic value of the information becomes greater because the opportunity cost for following any alternative path also becomes greater.
KNOWLEDGE AND EFFICIENCY, OR INFORMATION OVERLOAD?

For centuries the written record of the most important information in society was safeguarded by monks. Societies, at least as judged in today's terms, were characterized by information scarcity. The demand for information greatly exceeded its supply. Both the spreading of established information to wider sectors of society and the accumulation of new information tended to enhance knowledge and understanding. This might be characterized as the acquisitive phase of information accumulation.

Because demand far outran supply, and the costs of replication were extremely high, books were enormously valuable. This information was guarded carefully. The most valuable books were chained to an immovable object. But the monks did much more than physically guard the information. They controlled access to it by making decisions with respect to who could read what books for how long, thereby imposing an information class system upon society. But perhaps even more significant was the fact that they taught selected people how to read, and they read the books to other selected groups that did not know how to read. Even for those who could read, the monks provided the appropriate contextual interpretation of the information. In sum, they exercised a high degree of monopoly of knowledge because of their unique position as gatekeepers to the information. The monks were information professionals who exercised an extremely important and powerful role in their societies.

In the course of my lifetime, I have experienced the transition from a condition of information scarcity to one of information surplus. It used to be that professional people, including PhD students and professors in economics, were expected to be able to review personally all of the important information in their field and make their own judgements with respect to relevance and significance. But now that is not possible. As if the explosion in books, journals, newsletters and related print material were not enough, now this is being supplemented by a rapidly growing body of electronic information sources that may ultimately dwarf the information available in print. The sheer volume of supply of information vastly exceeds that which can be individually assessed.

But this information is merely the raw material - some people would say data - for the creation of useful information products and services. If this raw material is to be useful, it must be structured and processed to meet particular objectives. Indeed, without a compass to guide one through this sea of incomprehensible decontextualized information, one can easily drown in a flood of incomprehension. In quantitative terms, too much information may be worse than too little because it is more likely to create confusion and suspend independent thought. One sees evidence of this problem in a variety of
ways. The large consulting firms, which advise corporations and governments with respect to major decisions, used to define their role as bringing more information to bear on decisions so they were enriched, that is, 'more informed'. However, the consultants do not justify their role in these terms any more. Now they are in the information destruction business. They justify their role by advising managers as to the 90 per cent of the available information that can be destroyed or ignored because it is not the key information for the decisions to be taken. Now the consultants point to the relevant information and protect decision-makers from the wave of unhelpful information that threatens to engulf them.

In addition, studies of corporate decisions have been made comparing decisions taken by corporations that employ all the latest information, technology and available databases with decisions taken by other firms that are not making full use of the information technologies and available databases; they have not been able to demonstrate that the resulting decisions are any better. In fact, a significant characteristic of decision-making in the information economy is that as more information has become available to guide decision-makers, the planning horizon for decisions has been shortened because of a growing inability to make good forecasts. The dynamic character of ICTS has created an environment in which the additional information has not been adequate to overcome the increased uncertainty created.

It is clear that data and raw information require context and meaning to be understood. Once again, society needs a professional class to guide it to the relevant information. Today we call this class of consultants, 'information professionals'. But the functions that are required, although still in their evolutionary phase, are not all that different from those of the old monks. The new “electronic monks” will not be guarding the scarce information; but they will be guiding users to the relevant information. The old monks may have been defending the information storehouse; the new electronic monks will provide the compass to guide users through the ocean of information. But in each case, it is the monk who stands at the gateway to the information that will lead to knowledge and understanding. If most of society is wallowing in a sea of incomprehensible information, will it be any better off than if it wallowed in a sea of ignorance?

The plethora of new database and information services now being developed will expand the opportunities for those with specialized and higher-level professional qualifications and relatively high incomes. In the process -and for the most part quite inadvertently -some traditional public markets and social services will be disadvantaged. The correlation between an improving quality and variety of telecom services and a declining quality and variety of postal services -a clear trend in most developed countries since the 1970s -is not accidental, and carries significant social implications that are not yet fully understood. It is important to emphasize that the impact upon the less educated
and the poorer classes of society will not be restricted to the displacement of social and public services. The greater impact may well be in the restructuring of information and communication networks and markets in ways that will deny them access.

It is evident from this analysis that increased ICTS can serve to improve the efficiency and equity of markets or to create market imperfections, inefficiencies and equity distortions. The effects in reality will depend largely on the effectiveness of public policy and market regulation at the international, national and industry levels.

THE STRUCTURE OF INTERNATIONAL MARKET LIBERALIZATION POLICIES

Financial Markets

The worldwide deregulation of markets has proceeded at a very uneven pace. The virtually complete deregulation of the financial markets, in combination with new global information and communication financial networks, has provided for such rapid movements of money capital around the world that it has become a cause of instability. The volume of international financial exchanges is now more than twenty times greater than the value of trade in goods and services, which has prompted some analysts to interpret the information economy as “casino capitalism”. This is associated with increased volatility in stock markets, currency markets, and economic activity in regions and small nations that are vulnerable to the resource allocation decisions of large foreign governments, transnational corporations and financial traders and speculators. Clearly liberalization of the financial markets has gone too far. Increased regulation of international financial markets is needed to reduce incentives for speculation and market manipulation in order to achieve greater stability and efficiency.

Product and Services Markets

The liberalization of international product and services markets is proceeding slowly through negotiations at the World Trade Organization (WTO) and related regional organizations on a sector-by-sector and industry-by-industry basis, but major steps in liberalizing markets have been taken over the last 15 years. More industries are subject to global competition, and consumers can buy more products and services in global markets. Deregulation has had, and is having a demonstrable impact on product and services markets and on resource allocation.
However, the structure of liberalization has been very biased in the direction of goods and services that the most powerful countries wish to export. The most significant barriers to trade, through import tariffs, taxes and domestic subsidies, are established in the agriculture and textile sectors of North American and European countries. These are the sectors in which developing countries have a demonstrable international comparative advantage. If they are to be able to use the ICTS to gain access to world markets and overcome their poverty and underdevelopment, they must be allowed access to liberalized global agriculture and textile markets. The WTO must pursue a more balanced policy of market liberalization in the interest of all countries.

**Labour Markets**

The liberalization of international labour markets has yet to get off the ground, due primarily to the fear in the rich countries of being invaded by the army of surplus unemployed from developing countries. Economic immigration to the rich countries is restricted to that needed to fill specific skilled and unskilled labour shortages. The impeccable logic of the efficiency of markets and the improved productivity from resource allocation on a global scale, which is immediately accepted for money capital, accepted in principle for physical capital in product and services markets, somehow doesn’t apply to human capital, which remains highly regulated, with even tighter restrictions being adopted by many rich countries today. Neither this inefficiency in the allocation of human capital, nor its accompanying hypocrisy in the rich countries, is sustainable. In the “so-called” global information economy, the policies of liberalization must be extended to the labour market. A global information economy can only function efficiently if there is a global market for human capital. Global markets must function in the best interests of the people of the globe, not just those in rich countries.

Clearly there is considerable evidence of market failures in some labour markets, as there is in some capital and product markets. An immediate deregulation of the world’s labour markets might create even more instability than deregulation of the capital markets. The challenge is to consider steps to the efficient deregulation of all resource markets in a coordinated and balanced approach. This suggests a very clear policy agenda to improve the allocation efficiency of all resources in a global information economy that includes the continuous gradual liberalization of global labour markets.
Intellectual Property Rights: Information Ownership

In the global information economy, information becomes a valuable resource for many applications, and a valuable product for others. More and more information is being recognized as “economically valuable” by increasing claims of intellectual property rights (IPR). Considerable information that used to be publicly available is no longer so, and monopolies of information are being established in the wealthiest countries and corporations. Laboratories and libraries in developing countries (and in some areas even in the US) can no longer afford to subscribe to scientific journals and reports. The application of monopoly pricing to specialized information monopolies protected by expanding interpretations of IPR, based on historic traditions of patents and copyright in the industrial economy, is artificially restricting access to information and distorting information markets.

Under the existing application of IPR in the information economy, information markets will continue to function inefficiently and lead to increases in the gap between rich and poor, both within countries and between countries. Outdated IPR legal protections make most information markets both highly inefficient and inequitable. They provide a major artificial barrier to trade. The establishment of liberalized IPR laws and regulations for the information economy that promote economic efficiency and equity must be a high priority for national governments and international agencies, including the WTO.

PRODUCTIVITY IN THE NEW INFORMATION ECONOMY

Access to the Information Infrastructure

The foundation for the information economy and advanced information and communication services will be a transformed and upgraded telecom network that will provide the information infrastructure over which the new electronic services will be supplied. Broadband telecom network connections will be needed in the workplace, home, schools and all other centers of activity, just as the telephone is needed now. The new information infrastructure will be the most important public utility of the 21st century economy. Almost all countries are in the process of developing and/or implementing policies relating to the establishment of new national broadband information infrastructures. These developments require a considered reassessment of public policy relating to the supply of public utility services in the new economy, comparable to that developed for telephone, electricity, gas and transport for the industrial economy. What is the best institutional structure for ensuring an efficient universal provision of information infrastructure services under condi-
tions that are accessible by all those who desire it is a fundamental policy now being debated in many countries (Melody 2002).

Those without access to basic information infrastructure services will be denied access to information and the ability to act on the content conveyed, whether it relates to economic, social, cultural or political activity. There is already concern about a “digital divide” in access within the US and other wealthy countries, and also between the rich and poor countries. Recognizing that the majority of the world’s population has never had access to a telephone, it is apparent that the problem of information infrastructure access will deny them access to the information economy until there is a major global policy commitment to extend the advanced telecom network dramatically.

**ICTS Applications for Productivity Improvements**

Although the information/communication sector of the economy is extremely important in providing a foundation for a modern economy, the major transformations that will bring about an information economy lie elsewhere. For the most part, the new information/communication technologies and services are intermediate goods. Their primary benefit lies not in their intrinsic value, but in their applications for other purposes. The productivity potential for an information economy lies in the potential for applying these technologies and services to change the way business is done, e.g. electronic commerce, the way organisations and industries are structured, and the way people choose to conduct their lives.

Banking and finance has been a leading applications sector. The industry has been restructured on a global basis. Banks have reorganised the way they function. We can readily recognise that we do our banking and finance very differently today than ten or even five years ago. Other industry sectors, including transport and tourism, manufacturing and services are at earlier stages in their respective transformation processes. Despite official government pronouncements by most countries announcing national commitments to Information Society policy goals, public sector applications lag noticeably behind private sector applications. It is particularly ironic because it is in the sectors of education, health and government administration where the potential benefits of information/communication technologies and services are arguably the greatest. The extent of productivity improvements for the economy will depend significantly upon innovative service applications in the public sector. (Melody 1997).
Defining the Public Interest in Public Information

Liberalization reforms of the telecom and other infrastructure segments of the economy have provided much needed new opportunities for private initiative for the development of the information economies. But governments have yet to mark out the domain of the public interest in the new market environment. An important question that has not yet been addressed is, what will be the universal information needs of the general public in the information economy and information society? If society is going through a transformation to a condition where information takes on increasing importance, then presumably there will be a definable set of public information needs essential to the maintenance of participatory democracy. This information will be necessary for individuals to function effectively as workers, managers, consumers, and knowledgeable, responsible citizens. The public information commons that will be essential to enable information economies to be inclusive rather exclusive has yet to be defined or even seriously examined. (Melody 1990).

COMPETITION AND REGULATORY POLICIES FOR CONCENTRATED OLIGOPOLIES

It is apparent that the dominant industry characteristic in the information economy will be highly concentrated oligopolies, especially in the information and communication industries. Information, communication infrastructure, and network communication services markets all have powerful economic tendencies to concentrated oligopoly market structures what Trebing has called “tight oligopoly”. (Trebing 1994, 1997). This raises a dilemma for governments with respect to the application of traditional competition laws and/or direct regulation.

The existing body of economic knowledge tells us that oligopoly yields market failure in the form of inefficiency, instability and indeterminacy. Too little output is produced and too much capacity is established for that output so that excess capacity will serve as an artificial barrier to entry. The rivalry tends to focus on non-price factors, often heavy marketing which provides an additional artificial barrier to entry. Prices are generally set well above costs, and significant price discrimination is typical, except when external factors or a rise in uncertainty stimulates a price war. Concentrated oligopolies often engage in explicit or implicit self-regulation to preserve market share and oligopoly profits. Some oligopolies engage in significant R&D and technological development, which can lead to crashing the barriers to entry of another industry, inter-industry rivalry and “waves of creative destruction”. But the transition to the new paradigm is likely to be highly inefficient and path dependent, leading to new industry arrangements which are far from efficient, and very often simply restructured oligopoly.
The traditional analysis is helpful to a degree, and utility regulation attempts to address some of the inefficiency characteristics of concentrated oligopoly. However, economic analysis of market failures and imperfect markets in recent years has developed additional insights into some of the distinct characteristics of network industry markets. Developments in the economics of networks have clarified the characteristics of both production and consumption network externalities (Economides 1996, Shapiro & Varian 1999). This becomes extremely significant in the information infrastructure and information industries as capacity networks are unbundled from service networks and an increasing number of players participate interdependently in competitive/cooperative relations to develop capacity and supply services.

Opportunities for strategic opportunistic behaviour, i.e., imposing network costs on others while realizing revenue from the contributions of others, will tend to promote inefficiency and instability. There are significant economies of scale and scope in networks, but we have learned most of these can be achieved without being internalized to the firm. For most information services on the information infrastructure, there are increasing returns in market expansion. Markets with these distinctive characteristics need rules if operator initiative is to be directed toward efficiency and universal service development. Regulation can influence where the oligopoly market rivalry is focused in the information infrastructure sector. Revised competition laws focused particularly on concentrated oligopoly, rather than simply on monopoly power, can help make information and network services markets workable. (Trebing 1994, 1997).

**ECONOMIC GROWTH AND HUMAN CAPITAL INVESTMENT**

It is by now clear that the ICTS revolution will not provide a wave of economic expansion in capital-intensive physical assets, comparable to the past waves of investment initiated by the railway, electricity, natural gas and the automobile. Each of these past innovations required enormous investments in physical infrastructure that carried with them massive employment of relatively unskilled and semi-skilled labour. In contrast, the information revolution is being driven primarily by skilled labour, representing a much smaller portion of the labour force. For the first time in the history of capitalism, the primary driving economic force is not physical capital, but human capital – the investment in skilled labour (Freeman and Soete 1994).

This is evident in the R&D that is yielding continuous innovations, even in the ICTS equipment manufacturing industries, which are increasingly dominated by software development. Just as computer software grew from almost nothing in the mid-1960’s to become larger than the computer hardware industry 20 years later, so a similar process has now begun in the telecom sec-
tor, most dramatically illustrated by the explosion of Internet services. The driving force is the information content and the communication capabilities, not the physical facility systems.

This is also true in the applications of information/communication technologies and services throughout the economy, and even in the delivery of new services to the home. Experimental trials around the world over the last decade have demonstrated that investments in state of the art technologies and services are not enough. There must be far more investment both in understanding consumer needs and in enhancing the consumer skill base before there will be widespread acceptance of these services. Thus there is increasing evidence that the pace at which the new technologies and services are driving the process of transformation to an information economy depends primarily on the pace of productive investment in human capital, i.e., the skill base of labour, management, consumers and policy makers (Mansell and Steinmueller 2000; Becker 1993; Schultz 1972).

In some respects this is a very positive state of affairs for it implies some very promising tendencies. First, it could significantly reduce the oscillations in the business cycle, which, in the past have been aggravated by the rise and fall of enormous investment in location-specific fixed physical capital. Investment in human capital can avoid these fluctuations. Further, in times of deficient aggregate demand in an information economy, it will be investment in human capital that should be the priority need to stimulate renewed economic growth. A second important characteristic of investment in human capital is that it closes the gaps between the traditional distinct economic activities of investment, employment, service provision and benefit to the population. In the industrial economy, investment frequently does not provide satisfactory employment, and a significant portion of the economy cannot take advantage of the goods and services on offer. If the priority infrastructure investment is in human capital, then the needs of people as workers, as consumers and as citizens, can be met with the same investment. It is both a resource input and a service output at the same time (Freeman and Louca 2001; Machlup 1980).

CONCLUSION

An information economy is so different from an industrial economy, and the understanding of economists and policymakers about its characteristics so limited at this stage, that we do not have nearly enough knowledge and understanding to manage an information or knowledge-based economy. To paraphrase Kenneth Boulding (1966), “the knowledge of economics does not include the economics of knowledge”. It is one of those areas that economists have long recognized, but rarely pursued. Only now that information and
knowledge are becoming central to the next phase of capitalist economic development is the subject beginning to get some concentrated attention.

Thus at present we have only very poor indicators to help tell the difference between productive and unproductive investments in information and human capital. Like any other from of investment, bad investments will simply waste resources. For example, by the best indicators available, the US invests more per person on education than any other country, but gets far less benefit from this investment than many other countries. At present we have only crude measures for identifying precisely where productive investments in information and human capital development might be made, or even identifying very clearly where good investments have been made. The best indicators available identify short run skill shortages, which are often misleading for the purpose of building the long run productive capacity in human capital that will best serve a country’s population and interests. In fact, we don’t know how to conceptualize adequately or measure the productivity of specific investments in human capital. This is one reason for the IT productivity paradox that economists have been debating for the past quarter century.

At the micro level we don’t know much more about the characteristics of information as resource inputs into production processes or service outputs from them. Information is not a commodity in the conventional sense, and we are just beginning to develop the conceptual economic and legal foundations for different forms of intellectual property in information.(Noll 1993).

Yet, sustained growth in future information economies will require investments in human capital as a high priority policy tool of governments – for macro economic management of the economy, for enhancing the micro economic performance of specific economic sectors, for building competitive advantage in regional and global markets, and for enhancing individual income and well being. If successful, the so-called “economic man” of industrial capitalism, the servant of accumulating physical capital, can be transformed back into a multi-dimensional human being whose human development is served by investment in the accumulation of human capital.

This chapter has identified some distinctive characteristics and priority policy implications of the new information economy, and signalled the directions in which policies must change if the new information economy is to function more efficiently and equitably than the old industrial economy. The analysis has demonstrated that it cannot be assumed the new economy will be better than the old. Although it offers great potential, it also offers greater possibilities for systemic market failures. More than the old economy, the new one will require the guidance of wise public policies if the potential benefits are to be achieved. That will require a better understanding of the new information economy than economists or policymakers have so far acquired.
REFERENCES


