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# TOWARD THE LEARNING REGION

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**Regions are becoming focal points for knowledge creation and learning in the new age of global, knowledge-intensive capitalism, as they in effect become *learning regions.* These learning regions function as collectors and repositories of knowledge and ideas, and provide the underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning. In fact, despite continued predictions of the end of geography, regions are becoming more important modes of economic and technological organization on a global scale.**

A new age of capitalism is sweeping the globe. In Silicon Valley, a global centre for new technology has emerged, where entrepreneurs and technologists from around the world backed by global venture capital invent the new technologies of software, personalized information and biotechnology that will shape our future. In the financial centres of Tokyo, New York and London, computerized financial markets provide instantaneous capital and credit to companies and entrepreneurs across the vast reaches of the world. In the film studios of Los Angeles, computer technicians work alongside actors and film directors to produce the *software* that will run on new generations of home electronics products produced by television and semiconductor companies in Japan and throughout Asia. Computer scientists and software engineers in Silicon Valley and Seattle work with computer game makers in Kyoto, Osaka and Tokyo to turn out dazzling new generations of high-technology computer games. In Italy, highly computerized factories produce designer fashion goods tailored to the needs of consumers in Milan, Paris, New York and Tokyo almost instantaneously. Teams of automotive designers in Los Angeles, Tokyo and Milan create designs for new generations of cars, while workers in Kyushu work to the rhythm of classical music in the world's most advanced automotive assembly factories to produce these cars for

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consumers across the globe. Throughout Japan, a new generation of knowledge workers operate the controls of mammoth automated factory complexes to produce the most basic of industrial products—steel. A new industrial revolution sweeps through Taiwan, Singapore, Korea, Malaysia, Thailand, Indonesia, and extends its reach to formerly undeveloped nations such as Mexico and China. And, once-written-off regions, like the former Rustbelt of the USA are being revived through international investment and the creative destruction of traditional industries.

Despite continued predictions of the 'end of geography,' regions are becoming more important modes of economic and technological organization in this new age of global, knowledge-intensive capitalism. Although there have been numerous excellent studies of the dynamics of individual regions,[1] the role of regions in the new age of knowledge-based, global capitalism remains rather poorly understood. And, while several outstanding studies have chronicled the rise of knowledge-based capitalism, outlined the contours of learning organization, and described the knowledge-creating company,[2] virtually no one has developed a comparable theory of what such changes portend for regions and regional organization.

This article suggests that regions are a key element of the new age of global, knowledge-based capitalism. Its central argument is that regions are themselves becoming focal points for knowledge-creation and learning in the new age of capitalism, as they take on the characteristics of *learning regions*. Learning regions, as their name implies, function as collectors and repositories of knowledge and ideas, and provide an underlying environment or infrastructure which facilitates the flow of knowledge, ideas and learning. Learning regions are increasingly important sources of innovation and economic growth, and are vehicles for globalization. In elaborating this thesis, the following sections provide brief descriptions of the new era of knowledge-based capitalism and its global scope, before turning to our discussion of the dynamics of learning regions.

## The knowledge revolution

Capitalism, as writers as diverse as Peter Drucker and Ikujiro Nonaka point out, is entering into a new age of knowledge creation and continuous learning.[3] This new system of knowledge-intensive capitalism is based on a synthesis of intellectual and physical labour—a melding of innovation and production—or what I have elsewhere termed *innovation-mediated production*.[4] In fact, the main source of value and economic growth in knowledge-intensive capitalism is the human mind. Knowledge-intensive capitalism represents a major advance over previous systems of Taylorist scientific management or the assembly-line system of Henry Ford, where the principal source of value and productivity growth was physical labour.[5] The shift to knowledge-based capitalism represents an epochal transition in the nature of advanced economies and societies. Ever since the transition from feudalism to capitalism, the basic source of productivity, value and economic growth has been physical labour and manual skill.[6] In the knowledge-intensive organization, intelligence and intellectual labour replaces physical labour as the fundamental source of value and profit.

The new age of capitalism makes use of the entirety of human intellectual and creative capabilities. Both R&D scientists and workers on the factory floor are the sources of ideas and continuous innovation. Workers on the factory floor use their deep and intimate knowledge of machines and production processes to devise new, more efficient production processes. This new system of economic organization harnesses the knowledge and intelligence of the team—the group social mind—a

sharp break with the conception of individual knowledge embodied in the lone inventor or great scientist. Teams of R&D scientists, engineers and factory workers become collective agents of innovation. The lines between the factory and the laboratory blur.

The factory is itself becoming more like a laboratory—a place where new ideas and concepts are generated, tested and implemented. Like a laboratory, the knowledge-intensive factory is an increasingly clean, technologically advanced and information-rich environment. In an increasing number of factories, workers perform their tasks in clean room environments, alongside robots and machines which conduct the physical aspects of the work. In some knowledge-intensive factories, laboratory-like spaces are available for workers, which may include sophisticated laboratory-like equipment—computerized measuring equipment, advanced monitoring devices, and test equipment. Workers use these laboratory-like spaces together with R&D scientists and engineers to analyse, fine-tune, and improve products and production processes.

## The global shift

This new age of capitalism is taking the form of an increasingly integrated economic system, with globe-straddling networks of transnational corporations and high levels of foreign direct investment between and among nations. Such investment is a vehicle for diffusing advanced technologies and state-of-the-art management practices and is a powerful contributor to the global flow of knowledge. Indeed, international investment has surpassed global trade as the defining feature of the new global economy. A United Nations report shows that today transnational corporations operate some 170 000 factories and branches throughout the globe. In 1992, this worldwide network of foreign affiliates generated $5.5 trillion in sales, exceeding world exports of $4 trillion, one-third of which took the form of intra-firm trade.[7]

Globalization is increasingly taking place through *transplant* companies and in some instances through integrated complexes of transplant factories and surrounding supplier and product development activities. The best examples of such complexes include Toyota and Honda's massive production complexes in the USA. In fact, Japanese automotive production in North America takes the form of an integrated transplant complex comprising seven major automotive assembly complexes and more than 400 suppliers located in and around the traditional industrial heartland region of the USA.[8]

Transplant investment is the source of important productivity improvement and economic growth. According to a recent study by the McKinsey Global Institute, transplants increase productivity by accelerating the adoption and diffusion of best-practice organization and management, and placing pressure on domestic industries to adopt those best practices.[9] The McKinsey study notes that:

> Transplants from leading-edge producers: (1) directly contribute to higher levels of domestic productivity, (2) prove that leading-edge productivity can be achieved with local inputs, (3) put competitive pressure on other domestic producers, and (4) transfer knowledge of best-practices to other domestic producers through natural movement of personnel. Moreover, foreign direct investment has provoked less political opposition than trade because it creates jobs instead of destroying them. Thus, it is likely to grow faster in years to come.

A recent OECD study provides additional empirical evidence of the link between foreign direct investment, productivity improvement and economic growth.[10]

Comparing investment and productivity patterns in 15 advanced industrial nations, the OECD study found that foreign-owned companies are typically more efficient than domestic firms in both absolute levels and in rates of productivity growth. The study found that these productivity gains resulted from more advanced technology than domestic industries, or from adding capacity. By contrast, productivity increases at locally owned companies more often resulted from downsizing and lay-offs. The study also found that international investment has been a key source of employment growth across the advanced industrial nations. In 10 of 15 countries studied, foreign-owned companies created new employment more rapidly than did their domestically owned counterparts, sometimes expanding their operations while domestic firms were contracting. In three others, they eliminated jobs, but they did so more slowly than domestically owned enterprises. The study found that the largest employment declines occurred in Japan and Germany, where soaring costs during the 1980s caused international investors to cut a significant number of jobs. Furthermore, the OECD study points to a link between investment and trade, as foreign subsidiaries tended to export and import more than domestic firms, with most of the imports taking the form of intra-firm trade.

Foreign direct investment has played a key role in the economic revival of the USA.[11] For example, productivity grew more rapidly in foreign-owned transplant manufacturing companies in the US than for the manufacturing sector as a whole during the 1980s. The real output of transplant manufacturers rose nearly four times as fast as all manufacturing establishments between 1980 and 1987. Transplant companies generated productivity increases and value-added which outdistance US-owned companies. From 1987 to 1990, for example, the rate of increase in plant and equipment expenditures for transplant industrial enterprises (eg non-bank, nonagricultural business) was five times greater than that for US-owned business. As of 1989, value-added per employee was substantially higher in transplants than for US-owned manufacturers. And, transplant companies have played an important role in the economic resurgence of the US industrial midwest—a region which produced more than $350 billion in manufacturing output, making it the third largest manufacturing economy in the world.[12]

Technology and innovative activity are also undergoing considerable globalization. For most of the Cold War, the USA was the world's overwhelming generator of research and technology. However, by the early 1990s, the combined R&D expenditures of the EC and Japan exceeded those of the USA, and their R&D efforts were much more focused on commercial technology. Furthermore, the share of patents to non-US inventors has increased dramatically, with non-US inventors accounting for nearly half of all US patents in 1992.[13]

As the pace of innovation has accelerated and the global sources of technology have grown, corporations have expanded their global innovative activities and cross-border alliances. A global survey of companies in the USA, Europe and Japan found that corporations are substantially increasing their reliance on external sources of research and technology for both basic research and product and development.[14] Furthermore, a growing number of corporations are establishing R&D facilities abroad. US companies conducted roughly 12% of their total R&D activities abroad in 1991, the most recent year for which reliable data are available. Japanese companies have established a global network of more than 200 research, development and design facilities.

The past decade has seen the progressive globalization of the US technology

base, as the USA has become the hub in the global science and technology system.[15] Since 1980, foreign companies have invested tens of billions of dollars in roughly 400 research, development and design centres in the USA. The annual R&D outlays of these facilities has risen from $4.5 billion in 1982 to $10.7 billion in 1992, and the share of total industrial R&D they comprise has grown from 9% to nearly 17% over the same period, roughly one out of every six dollars of industrial R&D spending in the USA. R&D spending by foreign companies is highly concentrated in sectors where foreign industries are highly competitive—European companies in chemicals and pharmaceuticals and Japanese and German companies in automotive-related technologies and electronics. The globalization of innovation is required to tap into the sources of knowledge and ideas, and scientific and technical talent which are embedded in cutting edge regional innovation complexes such as Silicon Valley in the USA, Tokyo or Osaka in Japan, Stuttgart in Germany, and many others.

## Toward the learning region

The shift to knowledge-intensive capitalism goes beyond the particular business and management strategies of individual firms. It involves the development of new inputs and a broader infrastructure at the regional level on which individual firms and production complexes of firms can draw. The nature of this economic transformation makes regions key economic units in the global economy.[16] In essence, globalism and regionalism are part of the same process of economic transformation. In an important and provocative essay in *Foreign Affairs*, Kenichi Ohmae suggests that regions, or what he calls *region-states*, are coming to replace the nation state as the centrepiece of economic activity.[17]

> The nation state has become an unnatural, even dysfunctional unit for organizing human activity and managing economic endeavor in a borderless world. It represents no genuine, shared community of economic interests; it defines no meaningful flows of economic activity. On the global economic map the lines that now matter are those defining what may be called region states. Region states are natural economic zones. They may or may not fall within the geographic limits of a particular nation—whether they do is an accident of history. Sometimes these distinct economic units are formed by parts of states. At other times, they may be formed by economic patterns that overlap existing national boundaries, such as those between San Diego and Tiajuana. In today's borderless world, these are natural economic zones and what matters is that each possesses, in one or another combination, the key ingredients for successful participation in the global economy.

Region-states, Ohmae points out, are fundamentally tied to the global economy through mechanisms such as trade, export, and both inward and outward foreign investment—the most competitive region-states are home not only to domestic or indigenous companies, but are attractive to the best companies from around the world. Region-states can be distinguished by the level and extent of their insertion in the international economy and by their willingness to participate in global trade.

> The primary linkages of region states tend to be with the global economy, and not with host nations. Region states make such effective points of entry into the global economy because the very characteristics that define them are shaped by the demands of that economy. Region states tend to have between five million and 20 million people. A region state must be small enough for its citizens to share certain economic and consumer interests but of adequate size to justify the infrastructure—communications and transportation links and quality professional services—necessary to participate economically on a global scale. It must for example, have at least one international airport and, more than likely, one good harbor with international-class freight-handling facilities. A region state must also be large enough to

provide an attractive market for the broad development of leading consumer products. In other words, region states are not defined by their economies of scale in production (which, after all, can be leveraged from a base of any size through exports to the rest of the world) but rather by having reached efficient economies of scale in their consumption, infrastructure and professional services.

For most of the 20th century, successful regional as well as national economies grew by extracting natural resources such as coal and iron ore, making materials such as steel and chemicals, and manufacturing durable goods such as automobiles, appliances and industrial machinery. The wealth of regions and of nations in turn stemmed from their abilities to leverage so-called natural comparative advantages that allowed them to be mass producers of commodities competing largely on the basis of relatively low production costs. However, the new age of capitalism has shifted the nexus of competition to ideas. In this new economic environment, regions build economic advantage through their ability to mobilize and to harness knowledge and ideas. In fact, regionally based complexes of innovation and production are increasingly the preferred vehicle used to harness knowledge and intelligence across the globe.

The new age of capitalism requires a new kind of region. In effect, regions are increasingly defined by the same criteria and elements which comprise a knowledge-intensive firm—continuous improvement, new ideas, knowledge creation and organizational learning. Regions must adopt the principles of knowledge creation and continuous learning; they must in effect become *learning regions*. Learning regions provide a series of related infrastructures which can facilitate the flow of knowledge, ideas and learning.

Regions possess a basic set of ingredients that constitute a production system (see Table 1). They all have a *manufacturing infrastructure*—a network of firms that produce goods and services. Mass production organization was defined by a high degree of vertical integration and internalization of capabilities. External supplies tended to involve ancillary or non-essential elements, were generally purchased largely on price, and stored in huge inventories in the plant. Knowledge-intensive economic organization is characterized by a much higher degree of reliance on outside suppliers and the development of co-dependent complexes of end-users and suppliers. In heavy industries, such as automobile manufacturing, large assembly facilities play the role of hub, surrounding themselves with a spoke network of customers and suppliers in order to harness innovative capabilities of the complex, enhance quality and continuously reduce costs.

Regions have a *human infrastructure*—a labour market from which firms draw knowledge workers. Mass production industrial organization was characterized by a schism between physical and intellectual labour—a large mass of relatively unskilled workers who could perform physical tasks but had little formal involvement in managerial, technical or intellectual activities, and a relatively small group of managers and executives responsible for planning and technological development. The human infrastructure system of mass production—the system of public schools, vocational training, and college and university professional programmes in business and engineering—evolved over time to meet the needs of this mass production system turning out a large mass of 'cogs-in-the-machine' and a smaller technocratic elite of engineers and managers. The human infrastructure required for a learning region is quite different. As its name implies, a learning region requires a human infrastructure of knowledge workers who can apply their intelligence in production. The education and training system must be a learning system that can facilitate

TABLE 1. FROM MASS PRODUCTION TO LEARNING REGIONS

| | **Mass production region** | **Learning region** |
|---|---|---|
| Basis of competitiveness | Comparative advantage based on:<br>• natural resources<br>• physical labour | Sustainable advantage based on:<br>• knowledge creation<br>• continuous improvement |
| Production system | Mass production<br>• physical labour as source of value<br>• separation of innovation and production | Knowledge-based production<br>• continous creation<br>• knowledge as source of value<br>• synthesis of innovation and production |
| Manufacturing infrastructure | Arm's length supplier relations | Firm networks and supplier systems as sources of innovation |
| Human infrastructure | • Low-skill low-cost labour<br>• Taylorist work force<br>• Taylorist education and training | • Knowledge workers<br>• Continuous improvement of human resources<br>• Continuous education and training |
| Physical and communication infrastructure | Domestically oriented physical infrastructure | • Globally oriented physical and communication infrastructure<br>• Electronic data exchange |
| Industrial governance system | • Adversarial relationships<br>• Command and control regulatory framework | • Mutually dependent relationships<br>• Network organization<br>• Flexible regulatory framework |

life-long learning and provide the high levels of group orientation and teaming required for knowledge-intensive economic organization.

Regions possess a *physical and communications infrastructure* upon which organizations deliver their goods and services and communicate with one another. The physical infrastructure of mass production facilitated the flow of raw materials to factory complexes and the movement of goods and services to largely domestic markets. Knowledge-intensive firms are global players. Thus, the physical infrastructure of the new economy must develop links to and facilitate the movement of people, information, goods and services on a global basis. Furthermore, knowledge-intensive organization draws a great portion of its power from the rapid and constant sharing of information and increasingly electronic exchange of key data between customers, end-users and their suppliers. For example, seat suppliers for Toyota receive a computer broadcast of what seats to build as Toyota cars start down the assembly line. A learning region requires a physical and communication infrastructure which facilitates the movement of goods, people and information on a just-in-time basis.

To ensure growth of existing firms and the birth of new ones, regions have a capital allocation system and financial market which channel credit and capital to firms. Existing financial systems create impediments to the adoption of new management practices. For example, interviews with executives and surveys of knowledge-intensive firms in the USA indicate that banks and financial insitutions often require inventory to be held as collateral, creating a sizeable barrier to the

just-in-time inventory and supply practices which define knowledge-intensive economic organization. The capital allocation system of a learning region must create incentives for knowledge-based economic organization, for example, by collateralizing knowledge assets rather than physical assets.

Regions also establish mechanisms for *industrial governance*—formal rules, regulations and standards, and informal patterns of behaviour between and among firms, and between firms and government organizations. Mass production regions were characterized by top-down relationships, vertical hierarchy, high degrees of functional or task specialization, and command-and-control modes of regulation. Learning regions must develop governance structures which reflect and mimic those of knowledge-intensive firms, that is co-dependent relations, network organization, decentralized decision making, flexibility, and a focus on customer needs and requirements.

Learning regions provide the crucial inputs required for knowledge-intensive economic organization to flourish: a manufacturing infrastructure of interconnected vendors and suppliers; a human infrastructure that can produce knowledge workers, facilitates the development of a team orientation, and which is organized around life-long learning; a physical and communication infrastructure which facilitates and supports constant sharing of information, electronic exchange of data and information, just-in-time delivery of goods and services, and integration into the global economy; and capital allocation and industrial governance systems attuned to the needs of knowledge-intensive organizations.

## Building the future

For most of the past two decades, experts predicted a shift from manufacturing to a post-industrial service economy, or from basic industries to high technology.[18] In the wake of the predictions, efforts were undertaken to invest in new critical technologies and industries.[19] But, the change under way is not one of old sectors giving way to new, but a more fundamental change in the way goods are produced and the economy itself is organized—from mass production to a knowledge-based economy. This implications of the epochal economic transformation are indeed sweeping.

For firms and organizations, the challenge will be to shift towards the principles of knowledge-based organization, and to adopt new organizational and management systems which harness knowledge and intelligence at all points of the organization from the R&D labouratory to the factory floor. Maintaining a balance between cutting-edge innovation and high-quality and efficient production will be a critical issue. To do so, organizations will increasingly adopt best-practice techniques throughout the world, creating new and more powerful forms of knowledge-intensive organizations. Such organizational mechanisms are likely to blend the ability of 'Silicon Valley' style high-technology companies to spur individual genius and creativity, with strategies and techniques for continuous improvement and the collective mobilization of knowledge. Knowledge-intensive firms and organizations will be called on to build integrated and dense global webs of innovation and production. And these firms will increasingly be forced to build and maintain new regional infrastructures which can support knowledge-based production systems.

The new age of capitalism holds even greater challenges for regions. The very fabric of regional organization will change, as regions gradually adopt the principles

of knowledge creation and learning. Learning regions will be called on to supply the requisite human, manufacturing and technological infrastructures required to support knowledge-intensive forms of innovation and production. Rather than ushering in the 'end of geography,' globalization is likely to occur increasingly through complex systems of regional interdependence and integration. And, as the nation-state is squeezed between the poles of accelerating globalization and rising regional economic organization, regions will become focal points for economic, technological, political and social organization.

At a broader level, there is likely to be a shift from strategies and policies which emphasize national competitiveness to ones which revolve around the concept of *sustainable advantage* at the regional as well as national scale. Sustainable advantage means that organizations, regions and nations shift their focus from short-run economic performance to re-creating, maintaining and sustaining the conditions required to be world-class performers through continuous improvement of technology, continuous development of human resources, the use of clean production technology, elimination of waste, and a commitment to continuous environmental improvement. Indeed, the concept of sustainable advantage has the potential to become central organizing principles for economic and political governance at the international, national and regional scales. In this sense, there is some possibility that over time it may come to replace the increasingly dysfunctional *Fordist* model of nationally based political-economic regulation.

The industrial and innovation systems of the 21st century will be remarkably different from those which have operated for most of the 20th. Knowledge and human intelligence will replace physical labour as the main source of value. Technological change will accelerate at a pace heretofore unknown: innovation will be perpetual and continuous. Knowledge-intensive organizations based on networks and teams will replace vertical bureaucracy, the cornerstone of the 20th century. The intersection of relentless globalization and the emergence of learning regions are likely to erode the power and authority of the nation-state—the paragon of 19th and 20th century political economy. Whole new institutions for international trade, investment, environment and security will doubtless be created. While the new century holds out great hope, it will require tremendous energy and effort to set in motion the necessary changes, and an unparalleled collective effort to bring them about.

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