

***Globalization, Information and Communication Technologies
and Local and Regional Systems of Innovation***

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1.0 Introduction: Globalization and the ICT Paradigm

The current era of economic and technological change is marked by a profound degree of social dislocation and uncertainty. A cover story in Business Week ascribed the emergence of this 'New Economy' to two key factors. The first is the growing trend towards globalization which is increasing the linkages and interdependence between the economies of Europe, North America and East Asia in terms of investment, trade, research and development, and even product identification and marketing. The second factor is the emergence of a new integrated set of information technologies that integrate computers, telecommunications and media together in digital form and dramatically alter the economic calculus of production and distribution throughout the industrial economies. Together, these key factors are reshaping the economies of both the industrial and industrializing economies and changing much of the accepted wisdom about how they operate.

The resulting process of social dislocation and exclusion reduces the opportunity for growing numbers of people to participate effectively in the newly emerging economy, as well as undermining the economic viability of traditional communities and other social relationships. They pose a challenge for regions and local communities to simultaneously cope with the competitive realities of the global economy and learn to take advantage of the opportunities afforded by the new information and communication technologies. While these challenges may seem daunting, particularly for the less favoured regions in Europe and North America, a number of recent examples suggest that the obstacles can be overcome by 'bootstrapping' themselves into the new economy. However, the effectiveness of such an effort depends upon the ability of regions and local communities to marshal the set of resources that are critical to success in the new economy.

At the heart of the emerging techno-economic paradigm is the convergence of an integrated set of computer, communications and video technologies based on semiconductors and that share the capacity to process and transmit data in digital form. The current diffusion of these technologies throughout the industrial economies exerts effects as vast and sweeping as those that accompanied the second industrial revolution at the turn of the century (Tapscott 1996). The

new information and communications technologies (ICT's) dramatically reduces the cost of generating, storing, transmitting and processing information throughout all sectors of the economy. Thus, the new ICT's have increased the information-processing capacity of the economy at an exponential rate, while simultaneously enhancing the salience of knowledge-based inputs in every aspect of production. The dual character of ICT's makes it imperative to distinguish between the purely technical aspects of the technology and the accompanying organizational and intellectual ones — ie. between the 'hardware' and the 'wetware'.

The resulting economic paradigm is increasingly referred to as a 'knowledge-based economy'. This follows from the central role that knowledge-based activities have come to play in the production process, as well the rising proportion of the labour force that deals with the production, distribution and processing of information and knowledge in comparison to that proportion which handles tangible goods. The dynamic effect of the new paradigm results from the way it mobilizes knowledge, social intelligence, and innovative capacity. If knowledge is understood to include not just R&D, but also design, engineering, advertising, marketing and management, then knowledge-based inputs are becoming the defining feature of both manufacturing and service industries in the new economy. Together, the ability to deploy knowledge to create value and a sustained capacity for innovation are the keys to success for nations, regions, communities and firms in the emerging global economy.

However, it may be more appropriate to describe the emerging paradigm as a 'learning economy', rather than a 'knowledge-based' one. Learning in this respect refers to the building of new competencies and the acquisition of new skills, not just gaining access to information. The rapid pace of change associated with the 'frontiers' of economically-relevant knowledge, means that its economic value tends to diminish the more widely it is disseminated. The easier and inexpensive access to information tends to reduce the economic value of more codified forms of knowledge and information. In tandem with this, forms of knowledge which cannot be codified and transmitted electronically (tacit knowledge) increase in value, along with the ability to acquire and assess both codified and tacit forms of knowledge, in other words, the capability to

learn. In this sense, the dramatic effect of ICT's on the rapid diffusion and availability of information and the emphasis on a 'learning economy' are integrally linked. It is the capability of individuals, firms, regions and nations to learn and adapt to rapidly changing economic circumstances that is more likely to determine their future economic success in the global economy (Lundvall and Borras, 1998).

The impact of the ICT paradigm is intensified by the parallel emergence of new economic relations at the global level, subsumed under the concept of globalization. This concept implies that individual economies are becoming more transnationalized or integrated into the international economy and losing an important degree of national sovereignty and autonomy. The extent and nature of globalization, a subject of great dispute, can be gauged in several ways. One dimension refers to the growing integration of markets and production strategies, which facilitates the design and production of goods for global, rather than simply national markets. Similarly, the sourcing of components on a global basis, and the increasing reliance on the negotiation of strategic alliances with other firms for R&D, production or marketing of goods further contributes to the integration of national production strategies into a global one. The globalization of world markets is no longer limited to financing, production or sales, but extends as well to the ever greater internationalization of research and the acquisition of knowledge. The globalization of technology is linked to the increasing importance of R&D and knowledge in the new paradigm.

Despite the several aspects of globalization mentioned above, there remains a serious debate over the degree to which it has displaced the national economy as the dominant mechanism for coordinating economic affairs. The central issues in this debate concern both the proportion of economic activity which transpires in the global, as opposed to the national, economy and the extent to which multinational firms retain distinctive national characteristics and a primary allegiance to their home economy. According to Ostry and Nelson, techno-globalism refers to the fact that more and more, multinational corporations are exploiting technology globally and gaining access to new technology around the world through the diffusion of R&D and increased collaboration (1995: 24). The rise of information technology

and global telecommunication networks enables firms to organize and coordinate their R&D and their acquisition of technical knowledge on a global basis. It reflects one element of the growing reliance on strategic alliances by multinational firms. Companies that compete on a global basis are establishing research activities in key R&D centres and building strategic alliances with both university research centres and other firms deemed to possess complementary knowledge and skills. One illustration of this trend is the growing investment by the foreign multinationals in offshore, especially US-based research institutes, reflecting their efforts to benefit from the intellectual output of the US research system by harnessing their scientific and technological capabilities and generating new technological assets. The key issue in dispute concerns the extent to which techno-globalism is generating a convergence in either the patterns of technological activity. The available evidence suggests that despite the increasingly global nature of technological activities, national differences among the leading industrial countries, and regional specificities within them, remain significant and the specific character of the home base is crucial to the innovativeness of domestic firms (Pavitt and Patel, 1999).

2.0 The Global and the Local in the New Paradigm

The rise of techno-globalism and the relative easy transmission of data and information among firms has fostered the view that national and regional differences account for little in the emerging ICT paradigm — summarized in the familiar phrase about the ‘death of distance’ (Cairncross, 1997). This perspective underlies a great deal of the thinking subsumed under the banner of the Information Society, with its emphasis on speeding the rapid adoption and diffusion of new ICT's, particularly in the telecommunications arena and its bias towards the liberalization of telecommunications regulatory regimes to reduce the barriers to the adoption of the new technologies and ensuring equal access to the global information infrastructure. In this perspective, which focuses on the technological hardware, rather than the organizational and learning dimensions of the new ICT's, the leveling effect of telecommunications technologies accentuates the trend towards convergence, reducing the significance of national and regional differences in locational decisions. Thus the precise location of specific economic activities depends on purely economic factors, as opposed to spatial or cultural ones.

This perspective contrasts with an alternative one in the disciplines of regional science and economic geography. The alternative view underscores the fact that despite the growing integration of individual economies into a global one, the geography of production in the new economy is marked by a ‘paradoxical consequence of globalization’ — the simultaneous growth in importance of the locality as a site for innovation (Acs et al., 1996). As the information and communication networks created by digital technologies integrate the economies of the globe ever more tightly, they simultaneously increase the importance of space and proximity. The production paradigm of the new economy, with its emphasis on knowledge and creativity, is highly dependent on localized, or regionally-based, innovation. Innovative capabilities are often sustained through regional communities that share a common base of knowledge and the additions to that knowledge base.

Economic geographers have long observed that patterns of production tend to concentrate over time among networks of firms drawing upon the distinctive skills and characteristics of local labour markets. They use the term ‘territorialization’, to describe the range of economic activity that depends on resources which are territorially specific. The types of resources involved include specific assets that are only available in a certain place, or assets whose real value emerges out of the context of particular inter-firm relations that are grounded in the geography of a particular region or community. These relations become an asset when they create positive spillover effects among the firms in a region, that is when the knowledge of how to do certain things is shared effectively among networks of firms and their employees in a regional economy. The more rooted the economic activities of a region are in the specific assets of that region, the more fully territorialized are its activities (Storper, 1997). The globalization perspective tends to emphasize the leveling effect of new ICT ‘hardware’ in the rapid transmission and use of information or more codified forms of knowledge, while the regional perspective emphasizes the significance of space and proximity in creating the conditions under which more tacit forms of knowledge, the ‘wetware’ of the innovation process, are generated and shared among communities of researchers, firms and workers, thus conferring distinctive regional advantages.

These contrasting perspectives lead to radically different conclusions about the prospects for economic development at the local and regional level and significantly different policy prescriptions. The perspective associated with the ICT/IS approach emphasizes the economic significance of the information and communications 'hardware'. The quality of telecommunications access is a critical variable in determining the economic success of regions and localities in the emerging paradigm. This approach focuses on the competitive benefits conferred by state-of-the-art telecommunications linkages and their impact on leveraging local and regional economic development by providing:

- broad access to the global information infrastructure through programs, such as Canada's School-Net program, which has as its objective the linking of every elementary and secondary school in the country to the Internet;
- affording local firms new growth opportunities by providing them with better access to global markets and ensuring that the local communications infrastructure is competitive with that available in the more developed and advantaged regions and localities, thus allowing them to fully participate in emerging service trends, such as electronic commerce;
- reducing the previous barriers to inward investment by MNC's;
- creating new locational and/or niche market opportunities for less favoured regions through the attraction of new telecommunications-based services, such as the call centres in New Brunswick;
- new approaches to social integration for communities in distanced and disadvantaged regions, such as Canada's Northern Aboriginal communities; and
- better and more economical provision of public services through the development and implementation of new forms of telecom services, such as distance learning and tele-health.

However, considerable doubt has been expressed about the viability of this approach as a strategy for promoting economic development in less favoured regions. This approach accepts much of the promotional hype about the "death of distance" at face value, without examining the extent to which access to the hardware and infrastructure provide both necessary and sufficient

conditions to leverage economic development and innovation in less favoured regions. As noted above, when the access to information becomes a common feature of virtually all regions with the necessary telecommunications infrastructure, it is the local features which generate distinctive advantages that remain significant.

Furthermore, providing the necessary access to telecommunications infrastructure is unlikely to generate an adequate level of demand for the services on its own. As numerous studies have demonstrated, it is highly skilled and demanding end users that create the market for the most sophisticated of the new ICT's. It is not by accident that the greatest geographic concentrations of new digital media in North America (and Europe) are located in cities such as San Francisco, New York and Toronto which already constitute the important centres of cultural production and/or provide strong concentrations of users of these services in industries such as financial services (Brail, 1997). Furthermore, the exclusive focus on the hard technologies as the source of regional economic inequalities (and the solution to these problems) overlooks the extent to which organizational and cultural factors figure prominently in the ability of firms to adopt and use the latest technologies. The assumption that infrastructure access will be the determining criterion in the ability of regions to attract or develop successful firms in the new digital forms of electronic commerce is belied by the results of recent studies on the adoption of E-commerce practices, such as that by shop.org and the Boston Consulting Group (1998) and IBM and the Retail Council of Canada (1999). Finally, many of the jobs generated in the new telecommunication services, such as call centres, do not conform to image of highly skilled labour that is usually associated with employment in the high tech industries. As the case of New Brunswick has demonstrated, many of the jobs tend to be lower wage/lower value-added ones and the working conditions associated with them look more like those in traditional sweat shops than research laboratories. For these, and related reasons, a number of analysts have concluded that the Information Society approach, with its emphasis on the information infrastructure hardware, does not provide an adequate paradigm for responding to the issues of regional development in the new information and communications technology paradigm.

3.0 Local and Regional Systems of Innovation

As a consequence, both academic students and policy analysts are focusing attention on the concept of the regional innovation system as a more adequate basis for understanding the problems of regional innovation and development in the new paradigm and prescribing appropriate policy responses. The application of this concept at the regional level grows out of similar work at the national level which starts with the understanding that innovation and technical progress are sustained by a complex set of relationships among the institutions that produce, distribute and apply various kinds of knowledge. The innovative performance of individual countries is influenced by the way elements of this institutional system interact with each other in the creation and application of knowledge. Original contributions to the development of the concept were made by Christopher Freeman, Bengt-Ake Lundvall and Richard Nelson. A synthetic definition of the national system of innovation is provided by Stan Metcalfe, "A national system of innovation is that set of distinct institutions which jointly and individually contribute to the development and diffusion of new technologies and which provides the framework within which governments form and implement policies to influence the innovation process. As such it is a system of interconnected institutions to create, store and transfer the knowledge, skills and artifacts which define new technologies" (Metcalfe 1997, 285).

While the original work within this approach focused attention on the national or sectoral level, recent efforts have shifted to an analysis of the way in which innovation systems operate at the regional and local levels as well. While there has been some disagreement over the appropriate definition of a region, an important distinction is drawn between two types of regions: 'cultural' and 'administrative'. Cultural regions share certain features in common with "the classical definition of nation as a people sharing a common culture, language and territory but which either have not become states (e.g. the Basque Country) or forfeited that status (e.g. Scotland)", while the latter category includes subnational areas of jurisdiction within larger federal systems, such as the German Länder or US states, or newer forms of regional government within traditionally centralized democracies, such as France or Italy. All such regions are defined as "territories smaller than their state possessing significant supralocal governance capacity and cohesiveness differentiating them from their state and other regions" (Cooke, Uranga, and

Etxebarria 1997). Within this context, regional innovation systems include the notion of how the institutional and cultural environment of a region either supports or retards the innovation process. This is defined as “the set of economic, political and institutional relationships occurring in a given geographical area which generates a collective learning process leading to the rapid diffusion of knowledge and best practice” (Nauwelaers and Reid 1995).

A critical component of the innovation system of a region is the infrastructure of R&D institutions located within it, as well as the internal and external networks of relationships within and between public agencies and private actors. A number of recent schematics have been proposed to describe the RIS. One of these suggests that the RIS of a region should be conceptualized in terms of both the demand and supply side for innovation. On the supply side are located the institutional sources of knowledge creation in the regional economy. Closely linked to these are the institutions responsible for training and the preparation of highly qualified labour power. The demand side of the system subsumes the productive sector — firms which develop and apply the scientific and technological output of the supply side in the creation and marketing of innovative products and processes. Bridging the gap between the two are a wide range of innovation support organizations, those which play a role in the acquisition and diffusion of technological ideas and know how throughout the innovation system. These may include technology centres, technology brokers, business innovation centres, organizations in the higher education sector which facilitate the interface with the private sector and mechanisms of financing innovation, such as venture capital firms (Nauwelaers and Reid 1995).

Drawing upon this approach to local and regional economic development leads to a corresponding emphasis on how the unique cultural and institutional characteristics of individual regions and communities either stimulate or retard the innovation process within the new ICT paradigm. The importance of these cultural and institutional features derives from the difference between codified forms of knowledge and dynamic forms of learning within the new paradigm. As was noted above, the increased availability of data and information places a premium on the value of unique forms of knowledge. The new information and communication technologies tend to devalue what were previously localized knowledge assets by making them more ubiquitously

available through communication networks. However, this process in turn places a higher premium on the kinds of knowledge and learning that cannot be easily transmitted through these networks. Some types of knowledge exchange occur more effectively through direct face-to-face contact. The more tacit the knowledge involved (ie. the less explicit or codified it is), the more important is spatial proximity between the actors taking part in the exchange. The reason for this is twofold: first, it is partly a function of the economics of time and distance — it is normally less costly and easier to interact with others who are close at hand despite the convenience of electronic forms of communication; second, it involves the question of trust and understanding — the transfer of tacit knowledge is facilitated by an environment or context in which the participants share a common set of values and culture. Both these factors are facilitated by proximity (Maskell and Malmberg 1999). The value of face-to-face interaction, particularly in the context of an abundant technical and professional labour force and a supportive regional infrastructure, is great.

Closely related to the importance of cultural and institutional features in facilitating knowledge flows within regional and local economies is the acceleration in the processes of learning and especially social/organizational learning. In a period of significant social and economic disruption, this process is critical for the ability of regions and localities to adjust to the reality of the new economic paradigm. According to Lundvall and Johnson the stock of knowledge is affected by two flows: one which increases knowledge they call learning and the second which reduces it is labeled forgetting (Lundvall and Johnson 1994). However, the ability to acquire and retain new knowledge depends directly on individual and collective investments in acquiring knowledge. This ability, in turn, depends on the absorptive capacity of firms and institutions, ie. their ability to understand and absorb new forms of knowledge, which is largely determined by their prior level of investment in knowledge. This concept emphasizes the organizational and social dimensions of learning and the contribution made by shared cognitive frameworks to the process of learning (Cohen and Levinthal 1990).

The need to invest in both individual and organizational learning is necessary, but not sufficient to sustain a dynamic local or regional innovation system; there must also be a

recognition of the broader spatial dimensions of learning within a network or community in the geographic locale.. By extension, the processes of learning and knowledge acquisition are applicable not just at the level of the firm, but also at the level of the locality and the region. According to Richard Florida, “. . . 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” (1995: 532).

Regions which exhibit these features also tend to adopt more associative forms of governance, based on high levels of trust and social capital. This term signifies the growing shift from hierarchical forms of organization in both public and private institutions to more heterarchical ones in which network relations are based on conditions of trust, reciprocity, reputation, openness to learning and an inclusive and empowering disposition. According to a number of authors (Amin 1996; Cooke and Morgan 1998), this requires a shift from the reliance upon public authorities associated with the state to regulate economic affairs to a greater degree of self-regulation by autonomous groups in the economy and society. This, in turn, involves the transfer of authority and responsibility of some critical aspects of economic policy to a range of local organizations capable of providing the required services or programs (such as vocational training or technology transfer). It also necessarily involves a more decentralized, open and consultative form of governing. It is closely associated with the process of institutional learning and adaptation within the region (Cooke 1997).

The appeal of the associative model of governance, especially at the level of the more dynamic regional economies, derives from the insights afforded by this analysis. The associative model substitutes for the exclusive role of the public bureaucracy a mix of public and private roles and it emphasizes the context of institutional structures and learning. It involves the devolution of greater degrees of autonomy and responsibility for the policy outcome onto those organizations that will both enjoy the fruits of the policy success or live with the consequences of

its failure. According to Amin, the adoption of an associative model does not imply an abandonment of a central role for the state, but rather a rethinking of its role. In an associationist model, the relevant level of the state has to become one of the institutions of the collective order, working in relationship with other organizations, rather than operating in its traditional command and control fashion. The state in this model continues to establish the basic rules governing the operation of the economy, but it places much greater emphasis on the devolution of responsibility to a wide range of associative partners through the mechanisms of 'voice' and consultation (1995). For many of the reasons suggested above, this approach to governance seems to work most effectively at the regional and local levels.

The most dynamic regional levels of government have experimented over the past two decades with a wide range of policies to generate and diffuse new ideas and promote innovation — in other words to create the climate of a learning region described above. Differences in economic performance between the relatively more or less successful regions has prompted a corresponding interest in the mix of regional innovation policies and institutions that foster this dynamism. While these studies are still in their infancy, their conclusions have begun to coalesce into a new heterodox policy framework. Its conclusions suggest that dynamic local and regional innovation systems can be constructed, but there is no single blueprint or model for success. The framework has many different variants, reflecting the prescription that regional innovation policies must be context sensitive, ie. they must reflect the multiple realities created by different industrial cultures and institutional milieu in different regions (Storper, 1996).

4.0 Dynamic Local and Regional Economies

The construction of a dynamic local or regional innovation system depends in part on the past history of the region, its industrial culture and its endowment of infrastructural supports. In other words, it is path dependent — history matters. Yet examples abound of localities and regions that have altered their development trajectory through collective efforts to improve their endowment of institutional and cultural factors. A growing number of cases that are diverse in both their geographic location and institutional framework suggest that a combination of these factors can contribute to their success in the informational economy. Almost all confirm the

underlying importance of geographic concentrations of technical skills as a factor that is critical for their competitive success in the emerging global economy. They may differ in terms of the industrial structure that characterizes the region, the relative mix of industries on which their success is based, the underlying infrastructure of research and other institutions that support the local firms and the social or civic culture that creates cohesion in the region or locality.

History still matters – localities and regions must start from the point of their current assets and their collective experiences. As such they must confront the danger of being locked into a path of development rooted in their past economic trajectory, but there are also examples where communities and regions have deliberately altered that trajectory. Many instances are documented in the literature of dynamic regional economies that have accomplished this through a collective process of social learning and institutional adaptation. Similar stories can be found at the local and community level. The challenges at the local level are greater in some respects, because many of the factors that affect their chances of success are determined at the regional, national, or supranational levels. Their developmental path is thus influenced by the multiple levels of governance to which they are subject. What follows are three examples of successful developmental trajectories deliberately selected from North America and chosen from the experience of local communities.

a) Austin, Texas: Traditionally a government/university town, it is noteworthy for the rapid pace at which it has attracted a critical number of firms and national consortia in the high technology field through the dint of a coordinated planning and marketing effort. Its coordinated planning strategy was led by the IC² Institute at the University of Texas in Austin and the state government. Under the leadership of the IC² Institute, key leaders in the local chamber of commerce and key faculty and administrators at the University, launched a concerted effort to promote the growth of high-tech entrepreneurship in the Austin area. Building on the base of an existing number of technical branch plants located there in the 1960s (such as Texas Instruments and Motorola), the strategy achieved a significant number of successes in the form of new entrants to the industry (Dell), who were able to build upon the existing electronics base created by the technical branch plants, a number of government installations and a heavy investment by

the university in the field. Especially important was the \$4 billion endowment of the university which allowed it to make heavy investments in regional economic development and to leverage even larger sums of private and federal investment.

The critical achievements of this strategy were the success of Austin in attracting two national high technology consortia established in the 1980s, the Microelectronics and Computer Consortia and Sematech — through the provision of land and buildings for their location, supplemented with a heavy investment by the University in its computer science and electrical engineering units. The strategy was led by a coalition that included the Chamber of Commerce, the Chancellor's office at the University, a number of key faculty, and state government officials. While these initial successes generated an aura of growth and development for the region, the rapid pace at which it occurred brought other problems (Gibson and Rogers 1994). Austin is far from the ranks of a Silicon Valley, yet today it is widely recognized as one of the dynamic growth poles in the US economy. The key here is that Austin was able to shift its economic base through a deliberate, cohesive approach based on the mobilization of collective community (i.e., government/university/business) efforts and expanding its infrastructural assets.

b) *Spartanburg-Greenville, South Carolina*: Traditionally a low educated region with a poor manufacturing base, the area adopted a strategy in the 1960's of attracting textile companies from other areas, which by the 1980's, evolved to include automotive parts and manufacturing. The key here was two-fold: initially promoting a more open, global culture to make the area more attractive and accessible to foreign companies (Michelin); and then systematically upgrading the regional technical training infrastructure, which included developing specialized and customized training programs for firms that located in the region. This strategy culminated in the decision by BMW to locate its US manufacturing plant in the area in 1992, which led other firms to locate there as well (Kanter 1995).

c) *Toronto, Ontario*: This example is clearly not the case of a less favoured region or locality, yet it is one that has experienced considerable economic change and adjustment over the past two decades. The traditional financial and manufacturing centre of Canada saw considerable erosion

of its core industries through the recessions of the early 1980s and 1990s. The effects of the latter were intensified by the impact of the FTA with the USA and the subsequent NAFTA. Although the Greater Toronto Area (GTA) remains the second largest automotive production centre in North America, it also witnessed the rapid decline of many of its core manufacturing industries and the loss of a host of lower value-added firms. Yet, at the same time, it began to emerge as one of the core centres for software and animation as well as becoming one of the three major North American localities for multimedia production and services (with Silicon Valley and New York).

Two preconditions were critical in spurring this development: (a) the presence and strong value of key software capabilities at the university level (U of T; U of Waterloo) created through substantial investments by national and provincial governments in expanding the education and research infrastructure in the 1960s; and (b) the centrality of Toronto as a broadcasting, entertainment, and cultural production centre within Canada, with many of these industries growing or locating in Toronto as a result of federal policies in the 1970's to promote the development of Canada's cultural industries. The unintended and indirect effects of these policies led to the growth of a multimedia software sector because the cultural industries skills base was already present. The dynamism of this sector continues to depend primarily on the ready supply of highly qualified labour. This has been assured by judicious investments by governments (of all three political parties) in continuous upgrading and expansion of the training infrastructure, including the establishment of highly specialized training and research institutes. The end result has been an agglomeration of such companies in the Toronto area not only supplying, but also demanding, various multimedia related services and products (Gertler and Brail 1999).

5.0 Conclusions

Despite this variation, most studies agree that successful instances of local and regional innovation systems share a number of key factors in common. Chief among these is the role played by leadership and vision in promoting the environment of innovation and entrepreneurship that is the key to their success. Almost all studies of successful development

strategies point to the instrumental role played by a champion in promoting the growth of local industrial clusters. The source of that leadership may vary. In some regions, it comes from political institutions or industry associations. In others, it originates with an inspirational figure in a university setting or anchor firm that attracts or spins off like-minded individuals in other firms. In the end, their role is to mobilize those in the community with an interest in altering its development trajectory.

Closely related factor is the role played by a strong degree of civic-mindedness in the region. This civic culture is important for building a shared vision and goal for the region and in promoting the kind of networking and interaction that contributes to innovation through the creation of 'untraded interdependencies'. In some instances, especially in Europe, this tradition is the product of decades of historical development, much of which was unplanned and uncoordinated, but worked to create the right environment for innovation. In others, more recently in the US, they have emerged from conscious efforts by civic and business leaders to chart a new strategy for the locality or region. Together this civic culture contributes to the growth of social capital in the region which forms the bedrock on which networking and firm interaction can occur in the name of further innovation.

Another factor is the critical role played by the science and technology infrastructure in a region — usually institutions of higher education and training, but also corporate research laboratories, national or regional R&D consortia or local innovation centres geared to the needs of specific industries. It is not the mere presence of these institutions that contributes to the growth and development of the region; rather it is their success in generating a high degree of interaction with the industry and related business located in their region and their ability to promote a culture of innovation and entrepreneurship among their graduates and trainees. Where these institutions are successful in creating this kind of climate, they also contribute to the formation of informal linkages and networking among the innovative firms in their region. The exact nature of these linkages can vary considerably. In some instances, they take the form of tight buyer-supplier relations which contribute to a process of interactive learning. In other localities, knowledge sharing and exchange occur through their joint participation in local

research and innovation centres. A third model involves the kind of informal networking that occurs through the existence of a dynamic labour market and a high degree of labour mobility between firms. Whatever the exact form, all these types of interaction contribute to the spreading of tacit knowledge through the local economy and, in turn, sustains its capacity for innovation.

Another factor that is important is the availability of local finance to support the innovative firms in the region or locale. Once again, this takes a variety of different forms. In the successful Italian regions, the decentralized nature of the banking system has constituted an important source of capital for local firms. In the entrepreneurial climate of the US economy, knowledgeable and flexible venture capitalists provide an important source of risk capital. In the rather atypical case of Austin, even a university endowment fund has played this role. What matters most is the presence of local individuals and/or institutions with a knowledgeable background in financing innovation and a commitment to supporting local firms.

The final factor is the role played by government. In some instances, the role of regional governments has been central to the creation of the development model. In the US, the development path has been led more by the private sector, yet a number of government agencies and programs have played an important role. Government involvement seems to work best when it is undertaken in partnership with private sector leaders or champions, as part of a community-based coalition. This usually involves a new form of associative governance, where the political leaders share some of their traditional authority with local business and community leaders. While it is not the determining factor in the success of local development, it is usually a contributing one.

The lessons provided by these, and many other examples of successful regional development models, is that a dynamic innovative capacity can be created; it does not emerge merely by accident. The conditions under which this occurs may vary from locality to locality and the successful basis of one is not easy to reproduce in another. However, the key to making it happen is the creation of a shared vision and the launching of a coordinated effort within the community, based on a realistic assessment of its existing strengths and opportunities for growth.

6.0 References

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Biographical Note

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