

Transforming Enterprise

The Economic and Social Implications
of Information Technology



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Toward a Network Topology of Enterprise Transformation and Innovation

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Abstract

This chapter develops a framework of analysis of the emerging organizational network topology of the knowledge-driven economy in order to identify critical success factors in the process of innovation. The central argument of the chapter is that innovation constitutes the foundation of the competitiveness and value-creation capabilities of economic organizations. However, innovation is not something happening “inside” organizations but rather at the networked interfaces of organizations with the business, regulatory and institutional environments within which they operate. The knowledge-driven economy is an emerging economic system that is powered by information and communication technology (ICT), is knowledge-driven, is organized around electronic and organizational networks that generate knowledge and transform industries and markets, and is dependent on dynamic and flexible regulatory public institutions. For new ICT to diffuse throughout the whole economy, thus enhancing the knowledge and learning capabilities of organizations, firms, market conditions, and the institutions and culture of society need to undergo substantial change. It is the dynamic interdependence of these social conditions that is the source of innovation and value creation in the knowledge-driven economy. This is why the agenda of research on the dynamics of adoption of new economy practices, innovation, and economic growth needs to be expanded beyond the level of the firm. It needs to be built around the dynamic interrelationships between technological transformations, firms’ organizational and knowledge-creating capabilities, emerging market and industrial structures, and public institutions.

Introduction

Information and communication technology (ICT) is today recognized as the epicenter of a profound economic dislocation associated with what has come to be known as the transition to a new knowledge-driven economy. The capacity of organizations to engage in learning processes has increasingly come to be viewed as a crucial determinant of innovation, enterprise performance and economic development (Lunvall and Johnson, 1994, Nonaka and Takeuchi, 1994, OECD, 2001). In the emerging new economy innovation constitutes the foundation of the competitiveness and value-creation capabilities of economic organizations. Innovation has emerged as a strategic issue because of the disarticulation of established economic and social structures and processes that the knowledge-driven economy and society bring in their path. This disarticulation is the product of the interplay of technological, industrial, economic and social transformations. The alignment and re-articulation of

technological capabilities, especially ICT, through novel knowledge-creating organizational forms geared to constant innovation and value creation is the intangible quality that today determines the competitiveness of economic organizations and the national and regional environments within which they operate.

However, innovation is not something happening “inside” organizations but rather at the networked interfaces of organizations with the business, regulatory and institutional environments within which they operate. The process of innovation is increasingly driven by open-source networks of cooperation and involves dynamic interrelationships between technological transformations, organizational capabilities of firms, and public institutional and regulatory structures supportive of innovation and entrepreneurship. In other words, for new ICT that powers the knowledge-driven economy to be able to spread throughout the whole economy, thus enhancing productivity growth, the organizational structure of business firms, the institutions and culture of society need to undergo substantial change. This is why the agenda of research on the dynamics of adoption of new economy practices, innovation, and economic growth needs to be expanded beyond the level of the firm. It needs to be built around the dynamic interrelationships between technological transformations, firms’ organizational knowledge-creating capabilities, emerging market and industry structures, and public institutions (Boyer and Saillard, 1995; Berger and Dore, 1996, Castells, 2000).

Locating the strategic importance of networked organizational knowledge

One of the remarkable trends of the era of “irrational exuberance” was the almost exclusive emphasis of much business, academic and professional commentary on the dot.com phenomenon and, in retrospect, the unrealistic valuations of high technology and internet-based firms. Indeed, the proliferation of the “e” portions attached to economic activity, coupled to the rapid introduction of the internet in established business processes gave the impression that what was “new” in the emerging economic environment was the “transfer” of business processes online. In the wake of the collapse of the high-tech stock bubble academic and business opinion are marked not only by uncertainty but also by skepticism as to whether the technological transformations associated with ICT and the internet were the harbinger of a new phase in the development of the global economy or simply a temporary phenomenon that was brought about by rampant speculation. What is in question today is whether the technological, economic and organizational changes associated with ICT amount to the formation of a new economic system, a new economy. In this context, it is imperative that research in the domain of e-business in particular and the knowledge-driven economy in general be underpinned by explicitly articulated operating assumptions and conceptual categories.

E-business is not an economic activity conducted through ICT-enabled electronic networks. E-business is a central component of an emerging economic system that is powered by ICT, is dependent on highly knowledgeable labor, and is organized around electronic and organizational networks. The historical specificity of this new economic system is that it is *knowledge-driven*, it is *global* in its reach and it is *networked* in its operation in terms of technology and organization. It is *knowledge-driven* because the productivity and competitiveness of economic units depend upon their ability to create, process and convert information into knowledge geared to innovation and value creation. It is *global* because the core processes of production, consumption, and circulation are organized on a global scale through functional linkages among economic agents. It is *networked* because productivity and

competition are organized through a global network of interaction between and across business networks.

These three central features do not mean that the emerging economic environment leads towards the convergence of economic systems. ICT broadens the scope of economic activity, which means that business systems interact on a global scale. In this context organizational forms diffuse across regulatory and institutional environments, borrow from each other, and create organizational amalgams that correspond to common patterns of business organization and competition, while adapting to the specific social environments within which they operate. In other words, forms of economic organization are mediated by antecedent organizational forms, institutional structures and cultures. This mediation is of fundamental importance in the acceleration, or deceleration, of learning processes and processes of innovation (Castells, 2000, OECD, 2001).

One of the key drivers of change in the emerging economic environment is closely linked to two industries that not only introduced process and product / service innovations, but also applied such innovations to their own structures and processes, which resulted in higher growth and productivity, and through competition, to the diffusion of new business models throughout the economy. These industries are *ICT* and *finance*. The global interconnection of financial markets, facilitated by ICT and regulatory reform, is one of the main features that make the new economy global. At the core of the new ICT industries are the internet-centered firms and internet-related components of “old economy” types of organizations. However, the centrality of internet-related economic activity is not related to the until-recently exponential revenue growth and market capitalization value of internet-related firms. Instead, their economic and business significance lies with the potentially dramatic impact of ICT on the way “old economy” business is conducted.

The financial component of the new economy is related to the successive rounds of innovation during the last quarter of the 20th century that have resulted in a profound transformation of financial markets both organizationally and technologically. Financial markets are increasingly globalized and interdependent while they are one of the leading domains of application of new ICT. The global financial market is a central component of the emerging economic system. The ability of capital to flow in and out of securities and currencies across markets, and the hybrid nature of financial derivatives, are intertwining through regulatory changes. At the same time, ICT-enabled innovation is transforming the nature of financial transactions. The widespread use of ICT and the internet have fundamentally changed financial trade between companies, between companies and the investment community, between sellers and buyers, and not least, the stock exchange markets. This change has important implications not only for financial markets but also for the entire economy. ICT-enabled transaction mechanisms reduce transaction costs, thus significantly increasing market volume because the globally interconnected financial markets are able to mobilize savings for investment on a planetary basis, while accelerating the turnover of investment (Strange, 1986, Canals, 1997, Orléan, 1999, Castells, 2000).

The dialectical interplay between ICT and finance has been in many ways the central axis, the *flywheel* that accounts for the dynamism, global reach, and innovation potential of the emerging knowledge-driven economy. The technological infrastructure of financial markets allows for processes of financial innovation and the development of new financial products that create and allocate and destroy value on a global basis out of trade in securities. On the other hand, ICT-enabled financial innovation encompasses an increasingly larger sphere of

economic life where almost any potential source of value can be converted into a security and traded in financial markets globally through ICT-enabled transaction systems.

This process of conversion of potential sources of value into financial securities, i.e., securitization, is the driving force of the financial industry. Looking at the comparative performance of stocks of financial services firms and ICT firms between 1995 and 2002 the financial component of the new economy shows a 17% annual return. Financial services firms – the main providers of investment capital – have been the best performers, which reflects the growing centrality of the financial services sector in the economy (See Table 1). Financial markets, in this respect, constitute a strategic network of the new economic environment. For it is there that value is assigned to economic activity as represented by its stocks, bonds, derivatives or any kind of security. The valuation of companies, and thus their capacity to attract capital, depends in a fundamental sense on the judgment of the financial market.

Table 1 Percent increase in stock prices, 1/3/95 – 7/2/02 *

Financial services, banks, brokerages, insurance companies	224%
Health care, drugs, biotech, managed care	202%
Consumer staples, food, house wares, personal care	128%
Information Technology, hardware, software, services	125%
Industrials, machinery, transportation, business services	115%
Consumer discretionary, autos, media, retailing, apparel	107%
Basic materials, aluminum, chemicals, steel, paper products	39%
Utilities, gas and electric companies	17%
Telecom Services, telephone and wireless companies	1%

* Based on S&P 500 Sector Indexes. Data: Bloomberg Financial Markets
Source: *BusinessWeek*, July 15 2002.

The question of how this judgment is and should be formed is one of the most complex questions in contemporary economic analysis and is the subject of considerable debate. Nevertheless, recent experience and research suggest that *expectations* (on the part of financial markets) about the future growth projections of enterprises in terms of actual profitability and future financial value and *trust in the institutional environment* within which financial markets and enterprises operate are central determinants of investment (Castells, 2001). However, to reach the financial market, and to compete for higher value in it, firms have to go through innovation in technology, processes, product / service lines, management quality, and branding. Indeed, the ability to innovate in these domains becomes the cornerstone of competitiveness in the emerging economic environment (Tuomi 1994, Shapiro, 2002).

But the key to innovation lies in creative thinking and knowledge applied toward the identification of value-creating opportunities. It is leveraging these opportunities that leads to

value creation. Indeed, today the connection between organizational knowledge and innovation has become so critical that many companies consider organizational knowledge, coupled to organizational processes geared to continuously improving information and communication channels, as risk management. The reason is that sharing and transferring knowledge within and across organizations enables companies to increase organizational and operational transparency, which, in turn, helps to reduce risk. In other words, organizational knowledge is about access to timely and relevant information and the conversion of information into knowledge through open organizational channels of communication, which combine to improve judgment on the performance of a firm (Dore, 2001).

However, paths toward innovation are conditioned by three structural transformations associated with the new economy that have significant implications for the organizational structure of the firms operating in it. First, ICT centered on the internet, in combination with globally integrated financial markets, tend to overcome one of the historic impediments to market transparency: geographical distance (Harvey, 1991). Transparency is a highly transforming condition that affects two dimensions of the business process. ICT can theoretically increase transparency in the operation of financial markets. Openness of corporations to financial markets is primarily a function of the financial disclosure regulations that govern public trading, i.e., access to capital markets. ICT increases transparency in that it can enhance the ability of shareholders and other stake-holding constituencies of organizations to track more intensely the performance of managers and align it more closely toward maximizing the value-creating capabilities of organizations (Goldman Sachs, 1999).

On the other hand, ICT increases price and process transparency. Pricing becomes more transparent as more transactions can be put to the test of auction. Customers can track the progress of their orders while suppliers can get information electronically out of their customers' databases. This kind of transparency affects every aspect of business operations. Small changes in things such as price, product quality, service, responsiveness, and even partnerships could, in theory, be rapidly registered in market share shifts. Putting a business process online has effects throughout a company, since it introduces more information and volatility into strategy. As a result, partnerships and customer relations that underpin existing business models are being reconfigured. In reality, excepting financial markets where they are negligible, switching costs for most industries still represent a significant element of friction. Nonetheless, the internet contains the potential to move most industries closer to textbook transparency. As a recent authoritative report notes, the internet is "the mother of all looking glasses" (Morgan Stanley Dean Witter, 2000).

The second implication of the new economy acts on the level of the spatial organization of firms. As information technology and the internet become entrenched into corporate life, the economic foundation of the firm changes. Business theory on the spatial configuration of the firm has argued that the boundaries of firms are determined by the cost of transactions, especially the cost of communication (Coase, 1937). One of the central canons that guided business practice for much of the 20th century was that an enterprise should aim for maximum integration as a key to competitiveness and efficiency. In the new economy, by contrast, disintegration and decentralization are becoming the new canon for business competitiveness. There are primarily two reasons for this. The first is that the knowledge needed for any economic activity has become highly specialized which means that it is becoming increasingly costly and complex to maintain the necessary competencies for every major task within any given organization. And since knowledge is a quality that tends to be depleted unless it is used constantly, maintaining within an organization an activity that is used only intermittently leads

to incompetence. The second reason why disintegration and decentralization are becoming important is that the physical cost of communication is becoming virtually nil which means that in order to organize efficiently firms must search for the most economically optimum form of organization (Drucker, 2001).

The reduction of the information costs attached to transactions, thus, unleashes a process of reconfiguration of the internal and external boundaries of firms. The reduction of information costs enhances organizational capacity to link different operations within and between firms and outsource critical business process components. An important implication of this is the acceleration of the cycle from conception to rollout. At the same time, the internet is a fertile ground for the development of new ideas and hence competition, which reinforces the need for companies to develop mechanisms for “reading” and adjusting to the shifting conditions of competition. Within companies the implication is a greater need for collaboration in order to maximize synergies and increase efficiencies across all lines of the business process.

The third implication of the new economy is that it introduces a dialectic of centralization / decentralization in companies. This is largely a function of software standards required in order to enable the transfer of information within and between organizations with different software systems, naming conventions, procedural methodologies etc. At the same time, standardization increases the capacity of all parties involved (management, employees, external partners etc.) to “see through” the entire process. Transparency, in other words, though it significantly enhances the influence of shareholders also increases the potential of other corporate stakeholders or partners to “see through” a company’s activities. More specifically, it enables management to contribute to the activities at the frontlines of the company’s operations. On the other hand, in the context of the pattern of economic change and heightened competition companies need information at the frontlines of their operations. Hence the need for decentralized organizational forms that enhance the autonomy of employees not only in the generation of knowledge but also in terms of decision-making and action, in order to acquire knowledge of developments at the frontlines of their operations (i.e., the market touch-points with customers, suppliers, capital markets etc.) and to constantly adjust to shifts in the competitive environment within which a firm operates (Cairncross, 2002).

The structural impact of this set of transformations is that the process of innovation is increasingly becoming a function of open-source networks of cooperation. Open-source networks are composed of teams of company employees and entrepreneurs within as well as across the formal boundaries of organizations. Innovation itself is driven by three main factors. The first is the generation of new knowledge in the form of scientific and technological know-why, know-how and know-what and know-when and the practice of management. This presupposes the existence of well-developed public and private R&D systems able to provide the key ingredients of innovation. The second is the availability of highly educated, motivated and autonomous labor, capable of applying new knowledge in innovative ways to increase productivity and improve business performance. The third factor is the existence of entrepreneurs. Entrepreneurial drive is a key element of innovation since it functions as a catalyst in the transformation of new business ideas and projects into innovation and improved business performance.

In the emerging economic environment timely access to information related to each market a company is operating in is critical for competitive success. However, such access in a constantly changing economic environment marked by highly diverse market dynamics is not

feasible on the basis of inflexible and top-down organizational structures. ICT allows for the simultaneous decentralization of the information retrieval process from different spaces and for its integration into a flexible system. This technological structure spans different regulatory and institutional spaces which present the potential for large multinational firms to link with small and medium size enterprises according to contingent project demands forming networks that are able to innovate and adapt continuously. Business projects are implemented in diverse domains and can be directed to process, product and service line development and organizational tasks across different territorial areas. Successful business project implementation is a function of information that is generated and processed on the basis of ICT systems between and across companies, on the basis of knowledge acquired from each area. In other words, the key passages of information and knowledge that underpin the process of innovation run through networks: ICT and organizational networks within, between and across companies (Castells, 2000).

Knowledge and organizational design: the “network enterprise”

It is this set of structural transformations associated with the emerging knowledge-driven economy that largely accounts for the ascending importance of intangible corporate assets in the process of value creation (Lev, 2001). The growing importance of intangibles can be appreciated in historical perspective. For much of the early 20th century multinational firms were domestic firms organized internationally on the basis of a structure of subsidiaries that were operating quasi-autonomously within territorially defined institutional jurisdictions. During the closing decades of the 20th century multinationals tended to become increasingly organized on a global basis that was defined by product and service lines. More recently corporate strategies underpinning foreign investment are geared toward the development of structured relationships between companies operating in different sectors and institutional environments. In the emerging context, it is alliances, joint ventures know-how agreements and minority stakes that are becoming the critical components of innovation strategies. At the same time, the organizational topology of the operations of multinational firms spans a global regulatory and institutional matrix. This means that the critical tasks of management are becoming balancing acts of conflicting demands between short-term profitability and long-term strategic growth made by the modern corporation’s stakeholding constituencies: shareholders, i.e., financial markets, especially institutional investors and pension funds, customers, knowledge employees and communities (Drucker, 2001).

In other words, the transition to the knowledge-driven economy involves a shift in the parameters of the valorization process that increases the value of the intangible assets of organizations and more specifically their “organizational capital”. Organizational capital is not a “thing”; it is a relationship of different intra-organizational components or departments on the level of the firm itself and the relationship of these to the competitive, market, regulatory and institutional environment within which the firm operates. Successful management of “organizational capital” depends on the knowledge generating and learning capabilities of organizations and their deployment for innovation and value creation. The correlation between knowledge and organizational change and adaptation is a function of the fact that in the new economy though investment in technology is important, it is innovation in processes, product and service lines that is the key determinant of the innovation capabilities and market capitalization of firms (Brynjolfsson, Hitt and Yang, 2000, Bounfour and Damaskopoulos, 2001).

The term “organizational capital” refers to a nodal concept that is composed of several subcategories of intangible capital. It encompasses, but is not restricted to, the following. Market capital, which refers not the physical qualities of the products a firm produces, but the intelligence and know-how that go into creating and developing new products and services. It also includes intangible attributes that are closely related to products such as trademarks, patents, brand reputation, corporate reputation, and other insignia of corporate recognition; Intellectual capital, which includes the knowledge, skills, and competencies that the managers and employees of an organization possess; Structural capital, which includes any type of knowledge or innovation that affects ICT platforms, internal processes, which are critical to the formation of the processes that underpin the production and distribution of a firm’s products and services; Relationship capital, which refers to a company’s relationship with its customers and other stakeholders, including financial markets and the investment community, government and community institutional structures; Communications capital, which includes the benefits of leveraging and communicating intangibles which may result in positive financial analysis recommendations, increased investor demand, premium pricing, more committed employees, and so on.

The growth of the strategic importance of the management of “organizational capital” can be understood as a shift that places increasingly higher value to the information assets, or more correctly, knowledge assets of corporations. The differentiation of *information* from *knowledge*, in this context, acquires strategic significance. The value of information generated by computer systems depends on human interpretation. Knowledge, by contrast, resides in a social inter-subjective context and the human capacity for action based on that information. Thus, knowledge in a corporate organizational context can be distinguished from information since it is more directly linked to action and organizational performance. Organizations, of course, cannot manage knowledge *per se*. They can, however, create an environment that fosters the creation, continuity and sustained use of knowledge and its application within the organization (Davenport and Prusak, 1998; Von Krogh, Ichijo, Nonaka, 2000).

One influential approach to the management of intangible corporate assets has proposed a model of the knowledge-creating company which is based on the organizational interaction between “explicit knowledge” and “tacit knowledge” at the source of innovation. This perspective argues that much of corporate knowledge is “tacit” and cannot be communicated under formalized management procedures. Yet a corporation’s potential for innovation is significantly enhanced when it is able to build bridges that allow the conversion of “tacit” into “explicit” knowledge, “explicit” into “tacit” knowledge, “tacit” into “tacit”, and “explicit” into “explicit” (Nonaka and Takeuchi, 1994, Nonaka and Nishiguchi, 2001). This conversion can be facilitated through the use of ICT tools. However, the creation of a knowledge-creating organization is not an issue of technology, it is an issue of organization. More precisely, the creation of a knowledge-creating organization is a question of creating process, which involves aligning technology, people, and organizational qualities toward the achievement of specific organizational goals. And this is primarily a process that involves skills, competencies and commitment.

The quality of knowledge in the context of the new economy is not a function of the duration of formal education. Instead quality refers to the “type” and “relevance” of education to specific tasks involved in particular business projects. Labor in the knowledge-driven economy requires specific types of education that are characterized by continuous modification and expansion of the workers’ knowledge throughout their working lives. The most important feature of this learning process is learning “how to learn”, since in the context of accelerated

economic and technological change most context-specific information is likely to be obsolete in short periods of time. Learning “how to learn” involves addressing the kind of learning that goes beyond mere acquisition of facts for the purpose of performing a specific task better. It involves developing the ability to forge meaningful connections that result in an awareness of different perspectives, and teaches one to ask the relevant questions in specific spatio-temporal contexts. It also involves the development of the ability to transform the information obtained from the learning process into knowledge and action geared to improving organizational performance. These abilities demand continuous education and decision-making autonomy both of which have to do with a particular organizational structure and an organizational culture that instills commitment and encourages learning and autonomy.

Efficiently managing “organizational capital” depends in a fundamental sense on the development of organizational forms that generate mutually reinforcing dynamic interrelationships between ICT, organizational flexibility, and highly skilled and motivated labor (Bresnahan, Brynjolfsson and Hitt 2000, Bounfour and Damaskopoulos, 2001). There is a particular organizational form that has emerged as a critical component of competitiveness in the new economy: the “network enterprise” (Powell, 1990, Powell and Smith-Doerr, 1994, Applegate et al 1999; Dutta and Evgeniou, 2002; Hagel and Seely Brown, 2001). In contrast to earlier vertically integrated hierarchical organizational structures, this is a flexible organizational form of economic activity, built around specific business projects and strategic objectives. The business projects themselves are set in motion through the cooperation of networks of various and flexible duration periods, diverse origins and compositions of skills and competencies. Indeed, such is the structural change associated with the transition to the new economy that the basic unit of economic activity and theoretical analysis is increasingly the network, not the firm. The firm continues, of course, to be the basic repository of property rights, strategic management and the accumulation of capital. However, business practice is increasingly a function of *ad hoc* networks whose expertise is solicited for the achievement of specific business project goals. In terms of its internal organizational structure the “network enterprise” is characterized by several main trends: its organization is structured around process, not task, it has a flat organizational hierarchy, the work process is organized on the basis of teams, customer satisfaction is the primary measure of business performance, the structure of reward is based on team performance, the maximization of contacts with suppliers and customers is an integral part of the business process, and information, continuous training of employees at all levels are considered critical to business success (Castells, 2000).

Organizational knowledge beyond the boundaries of the firm: “clusters of innovation”

It is synergy among these networked organizational components and their interaction with the business, regulatory and institutional environment in which firms operate that decides the innovative capabilities and competitiveness of organizations in the knowledge-driven economy. ICT and the internet have long been considered as bringing about “the end of geography” since the transparency they introduce into the economic process makes location less important - organizations have access anywhere and anytime. Yet, recent research demonstrates a remarkable geographical concentration of not only the production process of technologies that presumably annihilate geography but also the continuing concentration of significant ancillary services key to the operation of the knowledge-driven economy, services ranging from finance to legal services and advertising. Why is this happening? Research shows that spatial concentration and geographical proximity continue to hold a fundamental

importance in fostering innovation. Innovation, in other words, is not something happening “inside” organizations but rather at the interface of organizations with the business, regulatory and institutional environment within which they operate (Saxenian, 1994, Porter, 1998, Gambardella and Malerba, 1999, Saskia Sassen, 2000, Crouch, 2001).

A key element in this spatial concentration has to do with “clusters of innovation” which denote organizational, social and institutional constellations that underpin accelerated paces of technological uptake, organizational knowledge creation and their deployment for innovation. These constellations incorporate specific sets of relationships of production and management, embedded in social and institutional structures that support a culture of entrepreneurship and encourage the development of new business processes geared to innovation. The central feature of the institutional infrastructure of these spatial concentrations is the synergistic network relationships they foster among and across firms and institutions of the public sector. Typical components of a “cluster” include companies that are networked within and through the cluster, venture capital firms, public institutions such as boards of trade and dedicated investment-attracting and promotion agencies (necessary for the creation of a business-friendly environment), universities and research institutes (necessary for the support of networked R&D activities and the generation of know-why, know-how, know-what and know-when). The key in the competitive position of “clusters of innovation” is their ability to generate synergy, that is, the added value that results not from the cumulative economic impact of the critical elements present in the cluster but from their interaction in a way that fosters innovation and value creation (Castells and Hall, 1994, Morgan et al., 1999, OECD, 2001).

The processes of organizational learning which are central to continuous innovation themselves display a spatial logic of concentration, which increases the importance of new forms of comparative differentiation across regions. Spatial proximity between organizations is crucial to the exchange of information and knowledge through which organizational learning emerges (Storper, 1995). However, it is important to differentiate between “organizational proximity” and “spatial proximity”. The former does not necessarily depend on the latter since the growing sophistication of ICT opens up new possibilities for the growth of effective learning networks among organizations based upon spatially dispersed interaction (Castells, 2000). However, the critical elements of organizational learning continue to take place within networks of organizations that are spatially proximate. Spatial proximity may create the conditions for organizational learning through channels of social interaction; for instance, by increasing the frequency of personal contacts among the knowledge agents within the innovation system. More fundamentally, however, at least some of the key elements of knowledge which are generated and disseminated through such social interaction are tacit, that is they are embedded in particular local social systems. Access to this social field of knowledge, as a result, depends on participation in the local social system within which such knowledge is produced (OECD, 2001).

Thus, while there is accumulating evidence of structural changes that sustain trends toward the globalization of economic processes this does not render the comparative difference among localities any less significant. On the contrary, a critical issue in the growing importance of locality has to do with the modalities and patterns of organizational learning that are implicated in the complex interactions between global and local processes. For instance, recent research indicates that the phenomenon of business incubation, that is, the creation of new businesses especially in regions that undergo industrial transformation, depends to a large extent on forging dynamic interrelationships between local business communities,

structures of regional political authority and regional scientific know-how as this is produced in universities and research centers and its commercialization through collaborative processes of knowledge and product or service development (CASIS, 2003).

The specific elements that structure the social and economic fabric of regions, that is, their economic structures, patterns of social and political relations, cultural and institutional settings, are themselves critical factors that condition and shape emerging patterns of economic development and organizational forms. Hence a key question regarding a locality's economic trajectory is the extent to which its social institutions can operate as frameworks enabling innovative responses to the challenges of the emerging knowledge-driven competitive environment (OECD, 2001). In other words, in order to reap the benefits associated with participation in a "cluster", firms, public bodies and all the central elements that compose the cluster need to be knowledge-creating or "learning organizations" (Morgan, 1997). It is this amalgam of private enterprises and public institutions, conditioned by different historical contexts across national and regional economies which tend to attribute different roles to the public and the private, that is at the center of systems of innovation in the knowledge-driven economy.

Conclusion

ICT is one of the central parameters in the transition to the knowledge economy. The capacity of organizations to harness the potential of ICT and engage in learning processes has increasingly come to be seen as a crucial determinant of innovation, enterprise performance and economic development. In the emerging knowledge-intensive economic environment the ability of organizations to generate new knowledge and apply it toward innovation in process, product and service lines of the business process constitutes a critical determinant of competitiveness. However, as a consequence of the structural transformations associated with the transition to the new economy, innovation is migrating toward a more complex topology of networks which "pass through" the organizational structures of individual firms and the market, regulatory and institutional environment within which they operate. The process of innovation is increasingly driven by open-source networks of cooperation and involves dynamic interrelationships between technological transformations, organizational capabilities of firms, and public institutional and regulatory structures supportive of innovation and entrepreneurship.

The diffusion of new ICT throughout the whole economy, which is a key condition for productivity growth, depends on broad-based mutually reinforcing transformations involving business organisations, the institutions and culture of society. The central challenge of modern management as well as public policy-making in this respect has to do with the development of strategic synergies between technological transformations, firms' organisational and knowledge-creating capabilities, emerging market and industrial structures, and public institutions. To put it another way, the transition to a sustainable knowledge-intensive economy depends on dynamics that extend beyond the domain proper of the firm. The sustainable profitability and social value of economic activity depends on the construction of linkages between technological capabilities, especially ICT, through novel knowledge-creating organizational forms geared to constant innovation and value creation in ways that support the competitiveness of economic organizations and the national and regional environments within which they operate.

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