

KNOWLEDGE INTENSIVE BUSINESS SERVICES

AND THE EVOLUTION OF CITIES TO THE KNOWLEDGE ECONOMY

Riccardo Cappellin
Faculty of Economics
University of Rome "Tor Vergata"
cappellin@economia.uniroma2.it

Lecture to the course on Regional Economics
Prof. Gioacchino Garofoli
Faculty of Economics, University of Insubria – Varese
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Content

Synthesis and policy indications

1. The process of interactive learning and innovation within network	1
2. The role of KIBS in knowledge networks	15
3. The structure of knowledge networks within cities	22
4. References	38

SYNTHESIS AND POLICY INDICATIONS

1. La società della conoscenza e la creazione di nuovi settori produttivi strategici

1. **La crescita lenta dell'economia italiana** nell'ultimo decennio non è dovuta né ad alti costi salariali né a tasse troppo alte e profitti troppo bassi, ma allo **scarso impegno delle imprese nell'innovazione e dei governi**, passati e presente, nell'**organizzazione del sistema nazionale di innovazione**. Dalla crisi economica attuale l'Europa può solo uscire con **massicci investimenti pubblici in innovazione e nel capitale umano**, che sostengano la domanda interna e la competitività esterna dell'economia. Non ci sarà **sviluppo economico dell'Italia** senza lo **sviluppo di settori nuovi** e questo richiede un **maggiore impegno nella formazione e nella ricerca**.
2. **L'innovazione dipende** da molti fattori, come lo stimolo della domanda interna ed estera di prodotti e servizi nuovi o la disponibilità di finanziamenti delle banche, ma dipende **innanzitutto a) dalla creazione di conoscenze e b) dallo sviluppo delle competenze**. **La creazione della conoscenza** non è simile né alla catena di montaggio di un'industria regolata da una autorità, né ad una gara competitiva nel mercato delle conoscenze ma è **il risultato di un processo di apprendimento basato sull'interazione tra diversi attori**, interni ed esterni alle università, e **sulla combinazione di conoscenze specialistiche e complementari**, sia codificate che tacite.
3. **La società della conoscenza è un concetto più ampio che un maggiore impegno nella R&S** ed è collegato ai concetti di capitale intellettuale, competenze, **processi di apprendimento e di creazione di conoscenza**. Inoltre, la società della conoscenza **non è solo ricerca e nuove tecnologie** dal lato dell'offerta, ma anche **l'emergere di nuovi bisogni sia individuali che collettivi da parte dei cittadini**, che hanno livelli di istruzione sempre più elevati, e il conseguente **sviluppo di nuove produzioni industriali e di nuovi servizi, privati e pubblici**.
4. **La dimensione sistemica dell'innovazione** determina l'importanza dell'esistenza di un **sistema di innovazione** (settoriale, regionale, nazionale o europeo) **composto da una pluralità di attori**, come imprese, grandi e piccole, spesso concentrate in cluster geografici e settoriali, istituti di ricerca e di formazione superiore, laboratori privati di R&S, agenzie di trasferimento tecnologico, camere di commercio, associazioni di imprese, organizzazioni di formazione professionale, specifiche agenzie governative e appropriati uffici di amministrazioni pubbliche.
5. Il concetto di "sistema di innovazione" sottolinea **il ruolo cruciale** non della pianificazione economica o del "libero mercato" ma **di una "governance" pubblica delle interazioni tra i diversi attori del sistema di innovazione**. La politica nazionale deve lanciare **progetti strategici di lungo termine di sviluppo di nuovi settori produttivi e di nuove tecnologie**.

2. The economic crisis and the challenges for the industrial policies in Europe

Major factors of competitive advantage of the European economy with respect to the many and large emerging economies are related to:

- the high **diversification of industrial productions** within the various industrial clusters allowing the **creation of new productions** as combination of traditional specializations,
- **the emergence of new needs**, which often have a collective nature, by consumers and citizens and the **creation of new markets**,
- **a highly qualified labour force**.

Medium technology sectors may further strengthen their international competitiveness in European regions with respect to the less developed emerging countries through their **capability to**:

- **markets: respond to the new emerging needs** in more sophisticated markets,
- **firms: introduce new products** characterized by high complexity and quality,
- **NIS and RIS: organize complex production systems** with a higher content of know-how and made by different complementary partners.

New challenges for the European regions and countries:

- shift the focus **from technology to knowledge**,
- promote **horizontal integration and diversification**,
- respond to **changes in the private demand**: economy of leisure and culture,
- respond to **changes in the collective demand**: economy of collective needs, such as sustainable energies
- change public policies: **increase public expenditure and taxes** to compensate **slower structural growth in private consumption**

- 2 -

1. The process of interactive learning and innovation within networks

Innovation is promoted by factors operating both on the supply side and on the demand side (figure 1). Among the first are: the costs and the quality of labour, the use of new machinery embodying modern technology, and the accessibility to qualified suppliers. Among the second are: the access to a specific market, the level of demand, the forms of competition, as also the existence of specific barriers to potential competitors, such as IPR, which insure a temporary rent. These complementary factors define the opportunities or the challenges in the external environment and they have to be complemented with the individual capabilities internal to the firm. In fact, the viability of a new process or product represents a necessary and not a sufficient condition. Innovation also requires the existence of subjective capabilities or immaterial factors. These latter are represented by the capability of the firm and the entrepreneur to elaborate an original long term project (i.e. a “business plan”) and a positive evaluation of the risk by the potential investors. Thus, internal knowledge and internal or external financial resources are two additional necessary conditions for the adoption of an innovation and they indicate the subjective capability/weakness existing in the firms in order to exploit external opportunities or to face external threats.

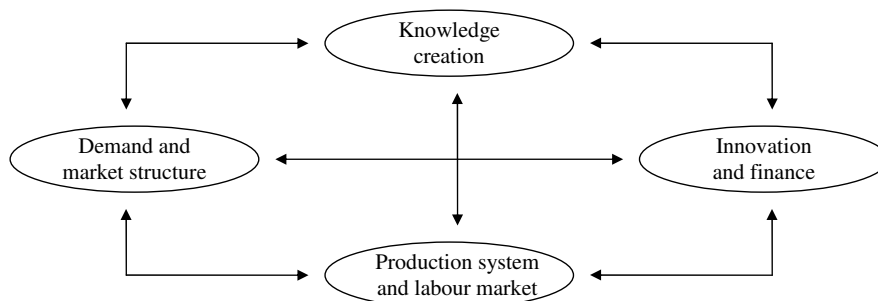


Figure 1: The relationship between knowledge creation and innovation

Source: Cappellin, R. and Wink, R. (2009), *International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters*, Edward Elgar Publishing, Cheltenham.

The emerging “knowledge clusters”, characterized by intense knowledge interactions between the various local actors, are the result of the evolution of the traditional “industrial district”, based on the exploitation of economies of scale external to the firms but internal to the cluster (Capello 1999; Capello and Faggian 2005; Cappellin 1998; Cappellin and Orsenigo 2000; Cooke, Heidenreich and Braczyk 2003; Cooke and Morgan 1998; Karlsson 1997; Maillat and Kebir 1999; Simmie 2005), to the model of the “knowledge economy” (Asheim and Clark 2001; Asheim, Coenen, Moodysson and

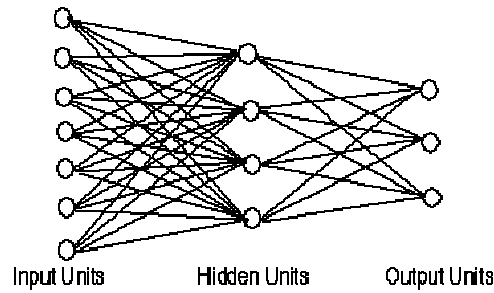


Figure 2: The structure of a simple neural net

The adoption of a network perspective allows to highlight some new aspects of the process of technological change. In fact, as in the model of neural networks (figure 2), an innovation is the result of an adaptive learning or searching process, which leads to new synaptic connections of various nodes. A scientific breakthrough and an innovation occur, when the joint impulses or signals coming from other nodes not only are compatible with the node considered, but also overcome a certain threshold of intensity or activation value. Each units calculates its own activation value depending on the activation values it receives from the input units. That allows the considered node to perceive this stimulus. The node may then decide whether to conflict with it or rather to adapt to it. The signal is then passed on to output units.

In particular, the pattern of activation set up by a net is determined by the weights, or strength of connections between the units. Weights may be both positive or negative, where a negative weight represents the inhibition of the receiving unit by the activity of a sending unit. Thus, knowledge creation depends primarily on the settings of the weights between the units. In a spatial setting these weights depends on geographical, organizational and cognitive distance and the existence of appropriate facilitating institutions and infrastructures (Cappellin 2003a).

If the stimulus is compatible with the existing cognitive system of a firm or a specific socio-economic actor, an interactive processing may lead to identify an incremental solution to an existing problem and that stimulates the act of innovation. Clearly also time is a crucial factor as it facilitates perceiving a continuous stimulus or absorbing and adapting gradually to it.

Therefore, in a network perspective, technological change may be interpreted as the result of the continuous or gradual search by each node, of the most appropriate level and form of integration or co-operation with the other nodes or actors within the network. Technological change is similar to a

process of iterative adaptation of the direct and indirect links between any couple of nodes in order to maximize their respective interaction and integration (Cappellin 2003a).

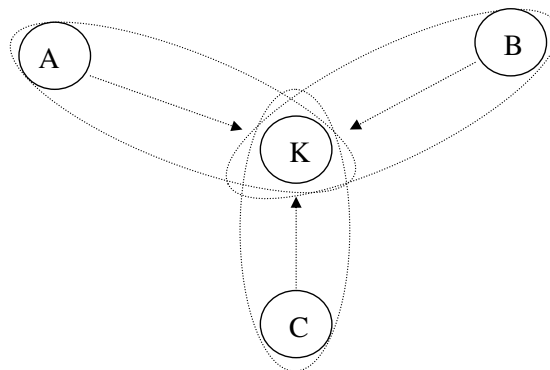


Figure 3: Creativity as combination of diverse accessible knowledge

Source: Cappellin, R. and Wink, R. (2009), *International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters*, Edward Elgar Publishing, Cheltenham.

Creativity requires “combinative” knowledge or the original combination of different “specialized knowledge”, which may be represented by information, technology, tacit and codified knowledge, in the framework of an iterative process of experimentation of failure and success. Creativity is based on imagination and pattern making which allow establish new connections between pieces of information and knowledge. Creativity requires the combination of knowledge in different fields and the interaction between actors having different competencies (Cappellin and Wink 2009). As the combination of the three basic colours: red, green and blue, creates all different colours, creativity requires the combination of previous knowledge. However, it also requires an enlargement of the cognitive distance, which is indicated by the arrows in the figure 3. Openness, connectivity, increased accessibility and receptivity are key conditions for knowledge creation. New ideas always develop at the frontier of different established knowledge fields, which are extended into new directions. In fact, the growth of knowledge is always at the margin (Loasby 2003). The model of figure 3 is analogous to the concept of the Weber’s “critical isodapane”, which allows to explain the spatial agglomeration as an effect of a decrease of transport costs. It also indicates that the three firms: A, B and C, which master three specific fields of knowledge, do not need to merge or to geographically agglomerate, leading to the creation of a geographical cluster, in order to create new knowledge, while they may only develop some forms of interaction by reducing the cognitive distance, which has previously separated them. Thus, geographical concentration into a cluster can be substituted by cognitive interaction within a network.

The innovation process in SMEs and in medium technology sectors has a gradual character and it is driven by an intensive interaction between suppliers, customers and other actors. This process of interactive learning leads to the development of “tacit” knowledge which is represented by a complex set of capabilities, which are localized or idiosyncratic and cannot easily be transferred (Cappellin, 2003, 2004; Howells, 2002; Wink, 2003).

Innovation in medium technology sectors may be interpreted not as the linear effect of a R&D investment, but rather as the result of a process of interactive learning, where various factors are combined and represent necessary but not sufficient conditions (figure 1) (Cappellin and Wink, 2009).

Figure 4: The logical structure and the functional phases in two different models of knowledge creation and innovation

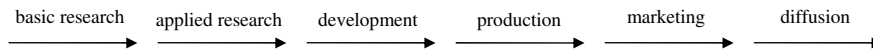


Figure 4.1: The linear model of innovation

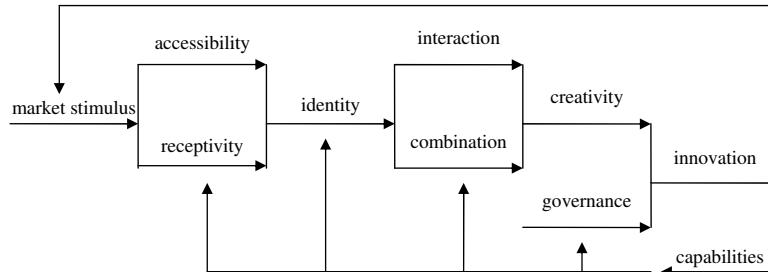


Figure 4.2: The process of interactive learning and innovation

Source: Cappellin, R. and Wink, R. (2009), *International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters*, Edward Elgar Publishing, Cheltenham.

In particular, the external stimulus induced by the opportunities of the demand, the pressure of competition or the change in technologies determines a tension leading to the search for a solution of the problems of the firms. This searching process is facilitated by a higher accessibility to potential complementary partners, and it also requires an appropriate receptivity of these latter (Boschma 2005; Torre and Rallet 2005). The creation and strengthening of a common identity (Becattini 1990; Crevoisier and Camagni 2000), made by common values and sense of belonging, is the prerequisite for the cooperation and the search for joint solutions. These latter are the result of creative capabilities and the original combination of

different and complementary pieces of knowledge through a process of interactive learning between various local actors. Then, new ideas can be translated into economic innovations only through an appropriate organization and governance, which implies the commitment of appropriate resources and the integration of the new ideas with complementary production capabilities. These phases seem to correspond to the indications of the literature on cognitive economics (Nonaka and Konno, 1998; Rizzello, 1999; Loasby 2003) and to the key factors in the Territorial Knowledge Management approach (Cappellin 2003b and 2007).

Moreover, innovation is leading to a process of learning and the development of new capabilities, which improve the various factors indicated above. Finally, innovation is going to change the external environment and it may represent the stimulus to innovation for other firms. That indicates that innovation is a dynamic and cumulative process.

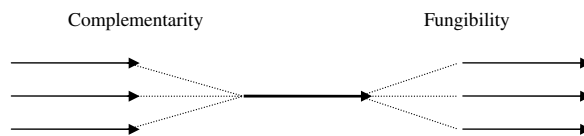


Figure 5: The complementarity and the fungibility of an innovation with respect to backward and forward innovations

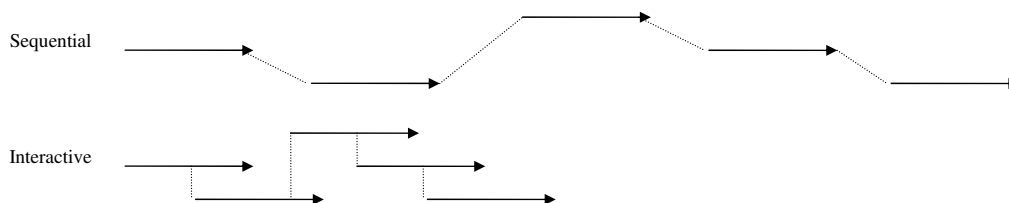


Figure 6: The speed of innovation in a sequential and in an interactive cycle between the firms in a cluster

Source: Cappellin R. (2009), Lectures of the course on Economics of Innovation, University of Rome Tor Vergata

Like in a storms of birds or fishes, many firms and actors participate to the process of innovation performing specific tasks and introducing innovation in their respective field of activities. They procure innovative products/services from supplier firms, which are complementary between them, and provide innovative products/services to client firms, which are fungible between them (Figure 4). The speed of innovation process is decided by the speed through which the firm is capable to select between the possible suppliers and between the possible clients (Figure 5). That allow to initiate a collaboration with other firms before they will complete their innovation and to collaborate with them in orienting the final results of their innovation effort. The speed of the process of innovation depends on the adaptive and strategic behaviours of each firm, as each firm in his turn, as in a race, assumes the role of key innovators and uses the contributions previously elaborated by other firms and provide an original opportunity for other firms, who are downhill in the supply chain, and will continue the innovation effort, as also for his competitors who will imitate and improve his original solutions. Governance or the capability to steer the action of other actors and the speed in decision making and coordination is more an art than codified knowledge.

In a dynamic environment the creation of value and of new knowledge depends on the integration of the knowledge acquired from many firms and the speed of innovation depends on the interaction between a plurality of actors. Due to their flexibility, networks represent the most effective form of organization to promote a fast speed of innovation. In fact, the major advantage of the network model of organization is to insure to the firms a faster access to a wide scope of complementary competencies existing in other firms and to remove the barriers, which are hindering to operate into new products, processes and markets and could lead to a lock-in situation. Through network integration, firms are capable to decrease the resources and time for adopting an innovation, with respect to the situation where they would be required to develop internal capabilities. This high flexibility is a key competitive factor in a dynamic market, where innovation has to be adopted faster than competitors.

Networks of firms and other regional actors promote interactive learning and evolution. Networks are a form of learning organization, which insures a greater overall dynamic efficiency. While competition and monopoly are static models, networks promote dynamic processes of adaptation, specialization and selection both within individual firms and at the aggregate level between firms.

The innovation process has both a microeconomic dimension within the individual firm or actor and systemic dimension in the relationships between the various firms or actors.

The processes of adaptation by the firms and of selection of the most competitive technological solutions first occur in a gradual form when the individual firms abandon traditional solutions, which are not adequate any more ("creative destruction"), and they make ex ante explicit technological and organizational choices, which choose temporary solutions to the individual problems through the iterative processes of research and experimentation based on successes and failures. Then, the processes of adaptation and selection occur ex post, at the aggregate level through the process of diffusion of the most innovative solutions, which have been experimented with success by some innovative firms and are later adopted by the firms lagging behind, leading to completely abandon the most traditional productions. The success or failure in the market selects the most innovative individual firms and the process of diffusion of innovation through imitation by the more traditional firms selects the most efficient production solutions of the considered regional economy, until the less efficient productions and technologies have disappeared.

6

In particular, the processes of adaptation and selection are tightly linked to a process of increasing specialization rather than to an increasing homogeneity between the actors belonging to an innovation network. In fact, the individual firms have access to external knowledge and transfer their knowledge to other firms. Each firm is led to re-elaborate the new knowledge obtained through the interaction in a way different from the other actors and can focus on a different selected field and generate an innovation. Firms gradually differentiate the products, the areas of overlap between firms decrease and each firm becomes more effective and innovative.

Thus, networks are characterized by lower "adjustment or switching costs" (Cappellin 1983) in the choice of new possible partners. Weak ties or indirect links can easily be transformed into strong ties or direct links, when the need to respond to external opportunities and threats make that necessary. For example, networks allow even to SMEs having access to the global markets, as through indirect links or the cooperation with large local or foreign firms it is possible to export and also to produce in remote areas without a direct investment of the firm considered. Networks also imply less "transaction costs" (Williamson, 1981, Cappellin 1988) in inter-firm relationships than a competitive market made by isolated producers and users. Within networks firms can easily change the level of cooperation with previous partners, as implicit contracts can more easily be adapted than formal contracts. Moreover, networks lead the various actors to invest in the creation or strengthening of soft and hard infrastructures and routines linking them. That makes the relationships between firms more intense or increases the speed of the flows between the firms.

In a governance perspective, networks allow that "ex-ante coordination", which is needed for long-term investments and major innovation. Networks facilitate the solution of conflicts between the various firms, which are inevitable in purely competitive market, thus reducing the costs and risks and the waste of time related to these conflicts and lacks of coordination. However, the network model limits the autonomy in decision making of the individual firm, compared to a competitive market made by isolated firms, or the case of a hierarchical organization, such as a single large integrated company or an autonomous state. Clearly, within networks decisions depend on an interactive process of negotiation between the various firms and other actors and often develop in time in an iterative way.

The process of innovation may be interpreted as the result of the sequence of various forms of networking, as indicated in figure 7. In particular, the discovery of inventions requires immaterial flows of codified or "analytical" knowledge. Then, the exchanges of engineering based or "synthetic knowledge" facilitate a timely adoption of a technological innovation. Then, the exchange of "symbolic" knowledge, such in the creation of new brands, allows a tighter integration with the culture and needs of the users and the growth into new markets and the exploitation of the latent demand in new market niches. Moreover, any innovation requires a greater investment and the access by the firms to financial networks, where more evaluation knowledge is needed in order to overcome the asymmetries of information between the firms and the financial institutions. Production innovation requires a restructuring of the traditional flows of intermediate products and services between the firms and implies the access to new qualified human resources and a higher labour mobility. Finally, innovation requires the creation of policy networks between the various local actors and flexible institutions and procedures to manage decision-making process characterized by many interdependent stakeholders.

7

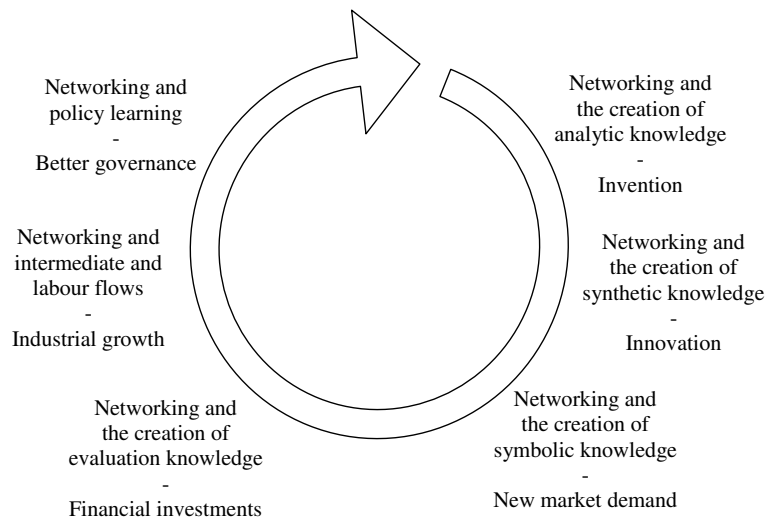


Figure 7: The different complementary networks in the innovation process

Source: Cappellin, R. and Wink, R. (2009), *International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters*, Edward Elgar Publishing, Cheltenham.

Table 1: Why the process of innovation in SMEs and in medium technology sectors differs from that of large firms in high tech sectors

	Linear approach	Systemic approach
Key word	Technology	Knowledge
Stimulus	Cost competition, supply changes and new equipment	Market orientation, demand changes and user needs
Process	In house R&D and technology transfers	Interactive learning
Role of human resources	Labour substitution and receptivity to new technologies	Competencies of the actors, creativity and entrepreneurship
Competitiveness factor	Productivity increase and economies of scale	Continuous innovation, flexibility and fast change
Governance process	Rational optimization by individual firms and market competition	Connectivity, iterative adaptation and selection within innovation networks
Policies	Public finance to R&D and public market regulation	Multi-level governance, bridging institutions and public-private partnership

In particular, the crucial points which differentiate a systemic approach from a classical or “linear” approach in promoting innovation in medium technology sectors are highlighted by table 1. The stimulus to change and innovation within firms is not only determined by the pressure of competition, the need to increase productivity and reduce costs, or the opportunity created by the supply of modern technologies and the use of modern equipments. On the contrary, the most important factor is represented by the identification of new markets, the aim to adapt to changes in the demand and the opportunity to satisfy new users needs. While in the linear process of innovation the formal process of R&D investment plays a key role, the systemic approach of innovation highlights that solutions are gradually discovered through a process of interactive learning involving many different actors also outside the R&D laboratories. The desired outcomes are not just the increase of productivity indicators, often interpreted as a disjoint result, but rather the speed of a continuous process of innovation, where each change is the evolution of previous changes. Entrepreneurship and governance, through public-private partnership, are required to organize the joint effort of different actors and firms. The focus shifts from stimulating competition between the local actors to promoting connectivity and iterative processes of reciprocal adaptation and selection of the best productive combinations.

Innovation policies should promote the process of knowledge creation and creativity, which is based on diversity, tight interaction between different and dispersed actors and on the capability to establish new connections between different pieces of information and knowledge. In fact, networks organize diversity and facilitate the combination of information and knowledge. The existing technological know-how or “synthetic” knowledge in production activities should be connected with greater creativity, improved quality of products and modern services and with the capability to respond to new needs of users.

Innovation requires flexible forms of cooperation between many different private and public, regional and international actors, such as large firms, SMEs suppliers, knowledge intensive services, higher education and research institutions, financial intermediaries, public administration and many other partners such as professional association and media. Innovation requires the combination of different competencies within a process of collective learning, as firms must cooperate to increase and diversify their knowledge base. Thus, cluster policies require new forms of governance of the relationships between the various local actors and also the identification / selection of new actors. In particular, while medium size firms have developed vertical flows of tacit knowledge within their respective supply chain, they need to be supported in order to develop horizontal linkages between different technologies. The multiplication of players and layers of negotiation – international, national, and local – demands a different model of government, called “multilevel governance”, based on organisational structures of interaction and partnership.

Table 2: Types and phases of a regional innovation network

	Ecological networks	Identity networks	Strategy networks
Type of relationship	External economies	Exchange	Joint investment
Form of interaction	Interdependence	Cooperation	Strategic coordination
Self-consciousness	Objective homogeneity	Subjective factors, intended relationships, sense of identity	Subjective factors, intended relationships, joint aims
Formalism	Informal relationships: imitation	Informal relationships: trust relationships	Formal relationships: contracts
External support	Geographical proximity	Common infrastructures, intermediate institutions and social capital	Joint decision making and policy making
Key knowledge base	Symbolic/synthetic knowledge	Synthetic/symbolic knowledge	Analytical/ synthetic knowledge
Key knowledge phase	Exploitation	Examination/ Exploitation	Exploration/ Examination
Knowledge interaction	Knowledge spill-over	Interactive learning	TKM and R&D
Differentiation process	Homogeneity	Autonomous specialization	Division of tasks
Innovation	Process	Organizational	Product
New firms	Imitative	More specialized	Innovative
Sectors	Low tech	Medium tech	High tech

Source: Cappellin, R. and Wink, R. (2009), International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters, Edward Elgar Publishing, Cheltenham.

Regional production systems are evolving from the model of industrial clusters and industrial districts based on many rather homogenous firms linked by flows of knowledge spill-over to the model of territorial innovation networks made by complementary specialized firms, linked by formal forms of cooperation in production, commercial and technological field, not only locally but increasingly also at the interregional and international level. Territorial networks may be classified into three types of networks: “ecological networks”, “identity networks” and “strategic networks”, which have different characteristics, as indicated in table 2. Regional production systems most often have evolved from the form of a simple agglomeration of similar SMEs, such as in so called “ecological networks”, to the form of a community characterized by intense processes of interactive learning, such as in so called “identity networks”, and they may finally evolve to the form of “strategy networks”, characterized by an explicit governance of knowledge interactions between the various firms.

In particular, the shift from an industrial to a knowledge economy implies a change from cost competition to time competition, which is based on innovation and creativity. The governance of knowledge and innovation networks allows a higher connectivity than in a free market framework. That favours creativity and leads to higher flexibility and faster speed of change, as indicated in table 3. Instead, a pure free market framework would lead to an increasing divide between the insiders and the outsiders and to potential conflicts, which would slow down the process of change. Thus, an inclusive strategy may reveal to be more appropriate in order to promote sustainable change in the long term. In fact, the speed of the information flows and the decision making processes is directly connected with the formalization of the network relationships and the design of contractual forms between the firms, the financial sector, the research and education institutions. Flexibility and innovation speed are related to the stability of the organization forms and the relationships between the various economic actors.

Table 3: From an industrial to a knowledge economy in medium technology clusters			
	Knowledge economy: competitiveness through innovation, high creativity		
Governance: identity Networks	Interactive learning and incremental innovation	Systemic innovation and territorial knowledge management	Governance: strategic networks
	Process innovation, technology suppliers, competitors imitation and lock-in effect	Vertical integration, large firms and technology transfers to subcontractors	
	Industrial economy: cost competition, low creativity		

Source: Cappellin, R. and Wink, R. (2009), International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters, Edward Elgar Publishing, Cheltenham.

In conclusion, innovation requires the combination of different competencies by various local and non local actors within a processes of collective learning, as firms are forced to cooperate to increase and diversify their knowledge base.

Innovation is not the result of the individual inventor or entrepreneur, but rather the result of a processes of collective learning and flexible forms of cooperation between many different private and public, regional and international actors, such as large firms, SMEs suppliers, knowledge intensive services, higher education and research institutions, financial intermediaries, public administration and many other partners such as professional association and media.

Knowledge circulates within networks through formal and informal institutions. Explicit or codified knowledge may be exchanged on technology markets. Instead, tacit knowledge requires allocation mechanisms which are different from the markets, since it has an asymmetric character, it implies high risks and it requires reciprocal trust, identity and shared values leading to collaborations. Only specific organizations and institutions and not traditional markets are capable to insure those connections which allow the exchange and the tight interaction of tacit knowledge and competencies. Intermediate institutions and also knowledge intensive business services (KIBS) may represent these knowledge intermediaries.

According to this new approach, the focus should shift from the aim to promote the adoption of modern technology to that of enhancing internal capabilities and knowledge. The stimulus to change and innovation within firms is not only determined by the pressure of competition, the need to increase productivity and reduce costs, or the opportunity created by the supply of modern technologies and to adopt modern equipments, but rather by the identification of new markets, the aim to adapt to changes in the demand and the opportunity to satisfy new users needs. While in the linear process of innovation the formal process of R&D investment plays a key role, according to the systemic approach to innovation, solutions are gradually discovered through a process of interactive learning involving many different actors also outside the R&D laboratories. The desired outcomes are not just the increase of productivity indicators, often interpreted as disjoint result, but rather the speed of a continuous process of innovation, where each change is the evolution of previous changes.

Since interactive learning is the key process in knowledge creation and the access to tacit knowledge is crucial in SMEs and medium-tech sectors, networks are an appropriate form of organization, which facilitates the interaction and the flows of information and knowledge. Within networks nodes and links are constrained by the existence of spatial distance. The role of KIBS may be crucial in the identification of key problems and in the design appropriate strategies.

14

2. The role of KIBS in knowledge networks

The service activities represent the largest part of the employment and of product in a modern economy. The industrial firms of most developed countries outsource a growing part of the manufacturing activities to other firms in countries with lower labour costs. They adopt capital intensive productive processes that allow to automate the productive cycles and to substitute the manual employment. The industrial firms rather specialize in immaterial or tertiary activities such as commercialization, design, finance, organization of production, management of the supply chain, transports and logistics.

The crucial factor of the competitiveness of firms has become the capability to continuously and quickly change the products and productive processes to face the international competition, which requires a continuous decrease of the production costs, a greater adaption of the product characteristics to the needs of users and a continuous substitution of the traditional products with new products, which satisfy the traditional as well as new needs of the consumers.

The development of services affect the development of the industrial activities and also it is influenced by the development of the latter. A strong industrial base is crucial for the development of qualified services. On the other side, the industrial base of a region or of an urban area can not be competitive without services.

The development of the service activities ("explicit" tertiary activities) is linked with the growing role that the services activities carry out inside of the industrial firms ("implicit" tertiary activities), where the activities of manufacturing transformation are sustained by the development of the tertiary activities. The demand of advanced services is tight complementary to the development of tertiary activities inside the industrial firms. The tertiary activities of recurrent use are carried out within the industrial firms, while those more specialized and less recurrent are bought from outside.

In other words, the main development factors of the tertiary activities are the evolution of the technology and the demand of the industrial activities, which require a greater quality and the continuous innovation of the productions in the framework of an international increasing competition, which makes impossible to be competitive on the base of low production costs in the developed economies. In fact, the tertiary activities both internal and external are crucial for ensuring high qualitative levels of the productions and of customer services and for promoting the product and process innovation.

On the other side, the development of the tertiary activities and the reconversion of the economy towards the tertiary activities is linked with higher education levels and the qualification of the workforce, the development of knowledge and the propensity of the workforce for not manual professions. Thus, the most developed economies will be more competitive in the sectors where is required a more qualified professional workforce, that is relatively abundant within these economies, while they de-specialize from those manufacturing sectors, where a not qualified workforce is required, since this latter is relatively more scarce than in the less developed countries. Due to this characteristics, the advanced business services are normally defined as "KIBS – Knowledge Intensive Business Services" in the international literature.

To sum up, the following typologies of knowledge-based services can be identified:

15

- “knowledge intensive business services” (KIBS), which include also the service activities to the people considered in their function of employees, such as professional education and mandatory social insurance;
- “knowledge intensive people services” (KIPS) and having a technology intensity, which require workers with a high professional competencies, such as health services, or which use in intensive way innovative technologies as ICT. They are innovative service activities that characterize a modern knowledge economy and together with KIBS are part of the larger definition of “knowledge intensive services” (KIS).

Clearly, that does not exclude that knowledge is increasingly important even in the case of the traditional services, both those addressed to the firms, such as for example the transports, and those addressed to the people. In fact, technology progress can be rather important and fast in the case of retail and various consumer services, such as in the case of the modern logistic and the large commercial distribution. That makes necessary specialized competences based on an higher level of knowledge.

The contribution of KIBS to industrial innovation

Usually, the role of KIBS is not to propose to the user firms the initial stimulus or the innovation idea, which rather emerges from the development and valorisation of the specific “core competences” of the firm. Rather, the role of KIBS in the innovation processes is to provide to the customers complementary knowledge with respect to the “core competencies” of the user firms. That complementary knowledge regard specialized sectors and its absence could make impossible the innovation or at least delay its development time. In fact, the technological and organizational competences within the industrial enterprises and especially within the SMEs must be integrated with external specialist competences, whether the firms can adopt specific innovations. The KIBS can only provide an interactive assistance to the user and increase the SMEs innovation potential, but it is certainly not possible that SMEs integrally outsource the innovation design function. That it is different from the case of the most traditional business services, as industrial firms can completely substitute some of their internal service activities with those provided by external service suppliers in the case of specific traditional tasks.

In particular, the knowledge intensive business services (KIBS) perform a key function in the phases of analysis and problem solving for the respective users (sometime defined as “evaluation” or organizational knowledge) as the particular professional competences of the workers within these services allow them to identify problems that are often of a complex nature that the same users are not able to identify and solve. Moreover, KIBS provide to the users specific solutions that overcome their cognitive deficiencies (that is the realm of the so called “synthetic” knowledge) . In that perspective, we may distinguish three types of functions: 1) problem identification and analysis; 2) diagnosis definition; 3) participation in the problem solving process.

Therefore, the distinction between traditional services and knowledge intensive services can be integrated by the distinction between: a) business services which cover routine needs, even if they can be qualified and be based on a specialized knowledge; b) business services with a less recurrent use which directly and explicitly contribute to the innovation processes of the user firms. Examples of KIBS, which typically have the function of promoting innovation are the engineering services, the management services and the research and development services carried out by specialized companies for other firms.

16

The tight interdependence between producer and user is typical of the production of a service, compared to the case of industrial production, given that the services can not be stored for their immaterial content. That interdependence results to be even tighter in the case of knowledge based business services. In fact, the service is jointly produced by the service and the user firms on the base of a tight interaction, within which the specific needs and capabilities of the user influence the final result, mainly in the specific case of services which aim to promote innovation within the user firm.

In this perspective the receptivity of the user firm play a crucial role. That depends mainly on its availability both of adequate and specific technological and organizational knowledge and on the existence within the user firm of implicit service activities, with which the external service activities can interact.

It is typical of KIBS, the capacity to combine in original way the specialized knowledge and often tacit knowledge available within the user firm with the more general and often codified knowledge available within the KIBS firm. KIBS uses the external codified knowledge that acquire from university centres, from the publications or from the professional networks which typically KIBS firms are part of. Therefore, they are not only based on knowledge, but they are also an efficient “organizer” of knowledge, due to their specific capacity to combine internal knowledge with external knowledge. In that perspective KIBS are “translators” of external codified knowledge for the user firm and they offer them a customized service or a service that focus on the solution of a specific problem in that firms.

The innovation process of SMEs, more than in the case of the large firms, is an interactive process, where the access to external competences is as much important as the development of research and competences within the SME. The “knowledge base” of the user firms is continuously enriched by the interaction with the knowledge existing within the KIBS. The interaction and the dialogue with KIBS facilitate the processes of: a) socialization; b) codification; c) externalization and thus of d) combination of diverse competences and knowledge present inside the firm with others coming from outside. In this perspective KIBS can be defined as “co-innovators” of the user firms.

The interactive activity between demand and supply or between users and provider in the production of a knowledge based business service determines that not only the knowledge can be transferred from KIBS to the user, but also that the opposite flow is important. In fact, KIBS learn from the experience of problem solving on behalf of a large scope of customers. This learning process, having a truly interactive nature, contributes to improve the competences existing within the KIBS. In that perspective, KIBS carry out the function of “intermediaries” in the innovation processes, as the “best practices” adopted by firms in different and also in the same sector are indirectly made accessible to other firms, which are characterised by more traditional technologies and organizational routines. Thus, KIBS facilitate the use of common organizational models and the sharing of technological knowledge between different firms and mainly between the SMEs of a local production system and in that perspective they carry out the function of “immaterial infrastructure” or “intermediate institution”, which facilitate the production cooperation within the networks of firms, the internal and external knowledge exchange and the internal coherency of a territorial production system or of a regional innovation system. According to Mueller e Zenker (2001), the interaction of KIBS and their customers contribute to stimulate the generation and the diffusion of knowledge within the national and regional innovation systems.

17

Types of knowledge within KIBS

The main factor that affects the supply of knowledge intensive business services is the endowment of knowledge, which characterizes the local productive system or the specific regional innovation system. Moreover, for their intrinsic nature KIBS require the management of the knowledge flows which represent their base resource, an explicit effort addressed to the development of new relationships and the governance of the already existing cooperative relationships.

The knowledge can be conventionally distinguished as follows:

- a) analytical knowledge, characteristic of science based sectors and R&D services,
- b) synthetic knowledge, characteristic of engineering services,
- c) symbolic knowledge, characteristic of the creative sectors such as fashion industry, the arts sectors and advertising services,
- d) organizational, institutional, political knowledge, characteristic of management consulting services and of the government activities.

A further typology is that distinguishing between:

- a) specialistic or modular knowledge, which may characterize SMEs in specific industrial sectors,
- b) combinative or architectural knowledge, which may characterize large firms having a plurality of suppliers.

Finally a third typology is that which distinguishes:

- a) localized knowledge and often tacit knowledge, typical of SMEs;
- b) general knowledge and often codified knowledge, typical of large research institutions.

The knowledge which characterizes the KIBS has characteristics which are common to each of these abstract typologies and to certain extend it passing through them transversally. In fact, even if with a certain schematization, it is possible to indicate that the characteristic knowledge of the KIBS and in particular of the technological services (e.g. engineering services) is similar to:

- synthetic-engineering based knowledge or symbolic-creativity based knowledge,
- combinative knowledge,
- general and codified knowledge.

In fact, the contribution of KIBS to the firms often has the characteristic of a codified knowledge and it is easily transmissible, such as a software programme, a written report, a project, a study or a programme of business reengineering. Moreover, the available knowledge within KIBS: "combinative knowledge", has the characteristics of a relative generality and it is highly fungible, being able to be applied to diverse problems and typologies of user firms. On the contrary, the knowledge and competences of customer firms and mainly of SMEs: "localized and specialized knowledge" is characterized by a tacit nature and it is not easily describable on a verbal way and therefore it is not conveyable to other firms.

That defines the first task of KIBS, which consists in the analysis and even in the first identification of the problem and of the capabilities needed to tackle this problem by the user firm. KIBS should have the capacity to identify the internal tacit knowledge within the respective users and to solve

18

their problems by integrating the external knowledge with their internal tacit knowledge. As indicated above KIBS carry out a role of "translators" of the existent tacit knowledge within their various customers and they combine these knowledge with the codified or tacit knowledge present within the KIBS themselves and being the result of the experience acquired through the contacts with other previous users. This bring to the solution of specific problems of the users and thus to promote and facilitate the change and the innovation. Moreover, KIBS support the further development of tacit knowledge internal to the user firms and in some cases also a further qualification of the competences of their internal human resources.

Knowledge creation and innovation within KIBS

While KIBS contribute to the innovation of the user firms, on the contrary it results more difficult distinguish the characteristics of innovation inside the KIBS. Generally it can be stated that the essential innovation within KIBS is characterised as follows:

- the continuous change of the service delivered to individual customers,
- the improvement of the quality and the typology of the services delivered.

For example, over the years the services offered by engineering companies have been gradually extended, together with an evolution in the very concept of engineering services. That has also determined the blurring of the traditional sectoral distinctions and the engineering companies have extended their activity from the traditional fields (such as: design of technical solutions in machinery and equipment engineering, civil engineering, hydraulic engineering and information technology), into various new fields (such as: finance, project management, marketing, health and safety, environmental studies, historical conservation, territorial and urban planning and architecture, transport economics and logistics, regional, urban and rural economic impact studies). These new fields may be tightly related and often they are also required in the planning and execution of major civil or industrial projects.

KIBS proceed to the recombination of the knowledge previously acquired, to its reprocessing and adaptation and this brings to the realization of new innovative services, which represent de facto an innovation for the KIBS themselves. In other words, the relationships of interaction between KIBS and the user firms bring to innovations not only for the latter, but also to the development of experiences, of competences and therefore of innovations within the same service, which is been delivered by KIBS. Thus, KIBS themselves are "innovators" and they not should not only be considered for the contribution provided to the innovative capabilities of their customers.

In synthesis, the process of knowledge creation within KIBS has an incremental and cumulative character and it is based on the succession of:

- a) application of general knowledge in the solution of the specified problems of the users;
- b) a gradual generalization of the results obtained in application experiences for the development of new both tacit and codified knowledge, which represent the base for further applications for new customers and new problems.

The succession of generalization phases and application phases in the process of creation of new knowledge and competences can be indicates as in the figure 8.

19

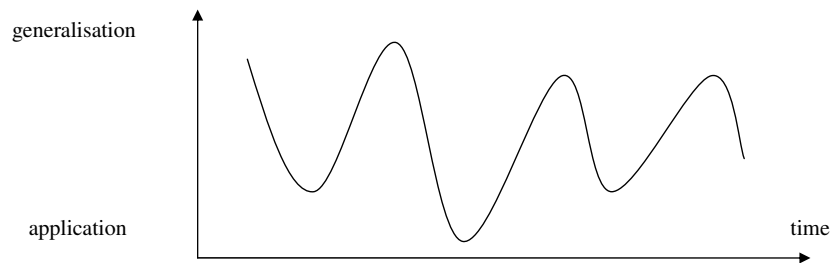


Figure 8: The process of knowledge creation within KIBS

The process of knowledge creation and innovation within KIBS is therefore based on the combination of diverse internal and external knowledge and on the tight interaction with the user firms and with other service firms, while the development of formalised activities of research and development, similar to those carried out within the university institutions and within the research departments of large firms, certainly has a minor role.

Therefore, this interactive learning process is clearly very different from the traditional model of technology transfer or from the innovation which is driven by explicit R&D investment within the single firm. On the contrary, it is similar to the innovation process which occurs within a cluster of SMEs or within the sectoral supply chains, characterized by forms of collaboration (“co-makership”) in the innovation between the client and the supplier.

In particular, the model of creation of the new knowledge and of generation of innovation in the KIBS is different from the “linear model”, which supposes a almost automatic sequence from basic research, to applied research, to development and to innovation. It is also different also from the “chain model”, that implies a tight relation or a feed-back between the activities of production and those of commercialization and of research activity within the individual firms. On the contrary, it has a “systemic nature” involving the interaction between different firms in fact, due to their service or “problem solving” nature, KIBS develop new knowledge and new competences in an informal way, on the base of tights relations with their users.

The key role of human resources in KIBS

The analysis of the supply of KIBS requires to focus on the relation between the KIBS firms and the workers which are employed in these firms and which can typically be defined as “knowledge workers”. In fact, the crucial factors of a KIBS firm are not the equipments or the physical structures or the technologies but rather the “intellectual capital” incorporated within the same employees. Thus, the development of the professional qualification of the employees plays a key role in the development of the KIBS supply.

20

That indicates the key role in the development of KIBS plaid by the professional associations and in general the creation of clubs, associations, often voluntary working groups, specialized reviews, conferences, training courses which allow to KIBS workers to acquire information and stay up to date. Typically these professional communities are self-organised but, due to the collective relevance of some professions, they are often regulated by the State through laws and regulations. Always, these communities have a local dimension and they are articulated by city, provinces, regions or countries.

These communities have a crucial role in the working of the labour market of the knowledge workers employed in KIBS. Trust logics, esteem as well as rivalry and sense of identity and belonging to group or profession are important. The structure of these professional networks is clearly rather hierarchic, given that the limited number of the firms or of the professionals, which are leader within their respective sector, is always particular limited compared to the overall number of firms and professionals.

The role of public regulations is important in defining the legal nature of the KIBS firms. For example, the firms in the sectors of engineering services and economic consulting services may have different legal status, as they may be corporations (share companies) or offices of associated professionals.

The spatial concentration of KIBS

KIBS concentrate in major urban centres, where the accessibility to regional demand and the supply of qualified human resources is mostly available. On the contrary, the lack of local demand and/or the emigration of qualified workers may determine a situation of dependence for other smaller urban centres.

The different growth level of KIBS in the various areas is the results of different birth rates in the various areas and of different performance of the firms located in these areas. On the contrary the emigration or mobility of KIBS between areas is only possible at short distance.

KIBS are tightly specialised and develop cooperative relations with different complementary services at the local level either through subcontracting relations or in the joint provision of services to the same users. The complementary relations between various KIBS leads to Jacobs urbanization economies and favour the concentration of KIBS in major urban centres.

The various regions or geographical areas within a region are different not only for their greater or lower endowment of some KIBS, while it is rather important the role that the firms and individual professionals of a given area have in the framework of their respective professional networks, which normally have not a local but rather a provincial or regional and even national extension. Normally, the largest urban centres do not only have a greater endowment of KIBS, but also, inside the individual service sector, they offer the services with superior qualitative levels.

21

3. The structure of knowledge networks within cities

Major cities are the international gateways of their respective national economy. They perform crucial roles in the global knowledge economy not least as import hubs for new ideas, new knowledge, new technology, new trends, etc. They are characterized by a global dimension and require a continuous development and investments in their international relationships to perform their gateway functions.

Urban areas are incubators of inventions and innovation and at the core of the transformation into the knowledge economy of their regions and countries. Based upon a high exposure of new information and knowledge from the global economy, a large intra-regional supply of qualified and demanding customers and a high accessibility to customers nationally and internationally, large city-regions function as seed-beds for the development of new innovative goods and services.

While most studies have examined the transition to the knowledge economy at the national level, in the various sectors and in the various geographical clusters, we still need a better understanding of the working of knowledge networks within and between city-regions and in modern knowledge intensive service (KIS) activities.

It is important to examine the role of cities in the transition of the European economy toward to the knowledge economy, as most of the European population is concentrated within cities. This role is tightly related to the role of people in this transformation. In fact, in the knowledge economy people are (Cappellin, Eurodite, WP2b, 2007):

- workers employed in new production processes,
- users of new goods and services and living in a specific area, often an urban area, and
- citizens, voters and decision makers on local innovation strategies.

In general, cities play six different roles within the economy, society, and territory, as they are:

- centre of economies of agglomeration and urbanization,
- incubators of innovation,
- gateways in interregional links,
- centres of a shared culture and identity,
- a living environment,
- political and administrative centres.

Cities are centres of economies and diseconomies of agglomeration (Convery, Halbert and Thierstein, 2006; Geenhuizen, and Nijkamp, 2007; Salet and S. Majoor, 2005; Vázquez Barquero, 2006). Innovation affects the transaction costs (Cappellin, 1988), which play a crucial role in explaining the agglomeration economies and the relationships between larger cities and smaller urban centres. In fact, actors concentrate when a dispersed location pattern would imply too high transaction costs. However, other factors may explain the crisis of a too concentrated settlement pattern, such as a very large metropolitan area. Thus, when the number of firms and households increases above a specific threshold, which may vary according to the sector

22

and the period considered, the transaction costs may increase and this may decrease the “localisation” and “urbanisation” economies. Various factors explain why the most appropriate spatial organization form of the transactions in the various sectors and in the labour market may not be a large metropolitan area, but rather a polycentric city-region

In fact, a network of interdependent and smaller urban centres within a city-region may be more efficient than a large compact metropolitan area, when the cost of the transfer and the elaboration of information between firms, tightly integrated among them in a specific production sector, may become very high and unmanageable, due to the congestion existing in a large metropolitan area. Secondly, a wider disparity between the local actors would lower the belief in common values, the common identity, and the spirit of solidarity among them, with respect to a small or intermediate urban centre. Thirdly, the increase of the number of the local firms could lead to a decrease in the reciprocal loyalty and thrust between the buyers and the suppliers and that would decrease the incentive to make specific or idiosyncratic investments, which would bound more tightly the tow actors or firms and this lower investments would slow down the process of innovation. Fourthly, the progress in telecommunication and especially the decrease in cultural, organizational, and institutional distances may determine a decrease of the transaction costs between two distant firms and reduce the need for a spatial concentration.

Thus, cities may have different optimal sizes according to the size of transaction costs. Different spatial patterns may coexist at the same time and the urban structure of a country or a region is usually organised by a complex network, where larger urban centres coexist with small urban centres, and the balance between large and small cities may vary in various countries and periods. Research should investigate the implications of these different challenges on size and structure of city regions on the governance structures and ways to exploit the potentials of decentralization and participation without losing the advantages of diversity and agglomeration.

Cities represent the incubator of innovations and of new productions (Acs, 2002; Begg, 2002; Bunnell, 2001; Camagni 1999; Capello 2001; Capello and Nijkamp, 2004; Cappellin, 1988 ; Cappellin and Batey 1993; Cappellin, 2000; Crevoisier and Camagni 2000; Feldman and Audretsch, 1999; Fujita and Thisse 2002; Glaeser, 1998; Glaeser, Kallal, Scheinkman, Shleifer, 1992; Karlsson, 1999; Karlsson, and Olsson, 2006; Landry, 2000; Lever, 2002; Musterd, and Deurloo, 2006; Musterd, and Salet, 2003; Raspe and Van Oor, 2006; Redfield and Singer, 1954; Rémy, 2000; Sassen, 1994; Simmie, 2003; Simmie, 2001; Storper and Venables, 2002). After the massive de-industrialisation of the urban economies during the 1970ties and 1980ties, the economic engine of cities has changed. In particular, cities have anticipated the rest of the economy in the deep changes occurred in the labour markets and in the organisation of the relationships between the firms.

Cities are the core of the far-reaching sectoral transformation of the national and international economy into the model of the “knowledge economy” and the competitive advantage of cities and regions is determined by a faster adoption of innovation.

Cities are the centre of research and higher education institutions and the preferred location of high-tech firms, involved in the development and research of new technologies. Cities facilitate the adoption of innovation, as they insure a better access to information on international markets and are characterised by the availability of qualified human resources and of highly diversified service and industrial activities.

23

They show a larger share of the business services on total employment and of cultural and social services, which are increasingly integrated with the knowledge value chain of industrial and service activities, within a broader concept of knowledge and innovation.

Thus, urban areas do not only own the economic potentials of agglomerations with pooling effects and spillovers, but they also represent the most suitable cultural and social environment for diversity of knowledge and creativity (Fujita; Thisse, 2002).

Cities are also a node in the transport and communication networks at the interregional and international level and perform the role of nodes or gateways in the relationships of a region with the outside world. They are characterised by a greater openness to international relationships or by a greater organisational and institutional proximity with distant regions and countries. That makes them different from their respective hinterland region, which is often characterised by an attitude of "local closure" and by lock-in effects.

The internationalization process creates new production linkages, as also consumption imitation, the attraction international investments in the regional territory and various forms of multilevel governance. An increased international openness may promote more opportunities for cooperation and not only for competition. An international framework is needed in order to promote the best use of the endogenous capabilities in the city-region and to promote its international competitiveness. Moreover, innovation within the urban areas requires the integration of domestic capabilities with external national or international capabilities. The process of internationalisation is a learning process, which leads to a gradual enlargement of the scope of the local networks and to tighter relationships between the local networks and the international networks.

Globalization is speeding up both the productive transformations and the economic development processes, leading to an increasing specialization and diversity of the economic and territorial system. The urban and regional system has become ever more polycentric and the regional and urban hierarchies tend to shrink as the relations and firm and city networks intensify, because of the effects of globalization.

There are two processes, which explain the diversification of the territorial system. On the one hand, the conversion of the national urban systems into a European urban system introduce a change in the inter-urban relations, leading to a greater diversity in the economic, political and institutional functions of the cities and regions within a more interactive and closely related urban system. On the other hand, a greater variety of products and activities reduces the concentration of productive and commercial functions in the largest cities or urban regions, due to the agglomeration diseconomies. This dynamic may lead to the creation of more flexible urban systems and the reduction of the historical urban hierarchies.

Cities are centres of a shared culture and identity, being the location of universities and cultural institutions. They create a cultural "leadership" effect on their region and contribute to the creation of an image, which facilitates the visibility of the region in the international economy.

Cities allow at least partially people to overcome the extreme individualism favoured by the competitive nature of economic relations and promote stronger social relations and forms of solidarity through spatial contiguity and the creation of meeting places.

24

Cities contribute to the advancement of knowledge due to their higher internal diversification, being a concentration of public and private activities, of service and manufacturing activities and of a variety of professional profiles. Cities stimulate the dialog among different cultures and the co-operation between different institutions and actors.

Cities are characterized by a multicultural composition, being the residence of many immigrants from various parts of the world. The wide range of different perspectives and voices may lead to an attitude of receptivity and tolerance, which favours innovation. On the other hand, the process of social integration of different cultures may be easier in intermediate cities, whereas in large cities, foreign immigration may lead to ethnic segregation and tensions.

Cities are also a living environment. Citizens and firms within cities are users and consumers, which express new needs and demand for new products and services (Cappellin, 2007). In fact, the close connection between potential clients, expressing new complex needs, and firms and organizations, endowed with advanced capabilities and open to form of collaboration with other firms and organizations, is representing a powerful stimulus to innovation. Thus, cities are also a key market, which represents a crucial opportunity for the development of new economic activities and birth of new firms.

That leads to a greater diversification of the urban economies and increases the capabilities of the European economy in facing the challenges of global competition with countries, which produce traditional goods at lower costs.

The role of people in the knowledge economy is usually recognized by focusing on the supply side of the economy, as tacit knowledge, competencies, collective knowledge and interactive learning processes are social processes, which lead to an increase of production capacity or of total factor productivity of the national economy.

However, the explicit reference to the demand leads to consider a new dimension of the knowledge economy. In fact, the knowledge economy is also characterized by the development of new products and services and especially by new needs and living habits.

Increased knowledge, higher education and higher cultural levels lead people and in particular the "knowledge workers" to change their preferences and behaviours. This is indicated by: changing attitudes to work and job preferences, greater preference for urban living, more interregional mobility, different time organization and an increased demand for leisure services.

Knowledge workers are also knowledgeable consumers, characterized by a larger demand for meeting places, travel, transport and ICTs, health, environmental quality, a higher demand for security and less crime, more demand for media, cultural activities and education, more preference for city-centre living, unfortunately leading to more car traffic, air and noise pollution, etc..

The respective role of consumers and the suppliers changes between markets, and many new services require a more active part by the users. Thus, there is the need to investigate the interplay between the demand (needs) and the supply (production capacity) and its consequences for policies in European city regions as well as EU policies creating incentives for the improvement of the knowledge bases of city regions.

25

In particular, consumption is not related to the monetary exchange between the consumer and the producer considered in isolation, but rather to the complex and changing distribution of individual roles within that specific community, which is interested to the use and production of the considered good or service. Clearly, the introduction in the market of a new specific good or service is not the result of individual action, but rather the result of an implicit coordination between all partners belonging to a specific community.

Thus, the creation of new goods and services may require the capability to aggregate emerging and diffused needs of a community or association of users, characterized by a specific culture and desiring a specific product or service. The possible conclusion is that in a modern society, individual producers cannot satisfy new emerging needs, but they require a collective, although not always national state, provision.

Often the introduction of a new service or product in an urban area is the result of self-production by the same users, either individually or most often in tight cooperation between individuals within a specific community. Later, when these service and products prove to be successful, they are imitated by firms, which expand the production for the market firstly within their region but afterwards also in other city regions around the world. An improved cooperation between European city regions can help European producers within these new markets to exploit faster and more effectively these possibilities of expansion.

In some cases, the consumption of goods and services is only instrumental in order to participate to a given community, as the real aim of the consumer is the possibility to socialize with other actors, characterized by a similar knowledge or culture. In this perspective, the definition of "community goods" seems more appropriate than that of "club goods".

Research should investigate the nature of these new communities and the characteristics of their members, to develop recommendations for changes in local governance and strategies for city regions. The use of policy forums could support the exchange of experiences between city regions, and increase the incentives for a more intensive cooperation.

While technological change and innovation have important complex effects on the urban environment, on the other hand urban policies, public regulations, and public expenditure represent key factors leading to the adoption and development of new technologies and innovation (Cappellin, 1997; Salet and Faludi, 2000; Salet, 2002; Salet, 2006; Salet and Gualini, 2006; Salet, Thornley and Kreukels, 2003; Wink and Karl, 2006).

Local governments may create a modern and high quality living environment through a better use of modern technologies in various fields of urban policies, such as construction of environmentally sustainable and technologically smart buildings, and re-conversion of industrial derelict sites. A high quality living environment also involves the creation of science parks, conference centres and similar new modern infrastructures, the adoption of energy saving technologies in residential building and in public and private transport, pollution control systems, the recycling of urban waste, efficient water management systems. Furthermore, local governments in modern urban areas must provide modern hospitals and advanced medical services, specific vocational training and further education courses, new entertainment and tourist activities, modern shopping centres, security controls technologies, and e-government technologies in the public administration. Thus, the traditional instruments of local policies within city regions have to be adjusted towards a changed environment.

26

Moreover, municipal administrations usually represent the most important companies in a city or regional economy. That implies that they have the possibility to orient local public expenditure to innovation in the various individual chapters of their budgets. As in the case of national public expenditure, the impact on innovation of local expenditure through the demand side may be very important and it is complementary to the traditional measures, such as public subsidies, working on the supply side. Examples for these are in the fields of cultural services as well as new technologies in public facility management or the implementation of new environmental services to reduce the risk and impact of climate change.

In conclusion, cities represent a "local production system" or a form of territorial network which is rather similar to other forms of territorial networks studied in regional economics literature, such as industrial districts, clusters, regional innovation systems and milieu innovateur. In particular, knowledge networks in a city region can be analysed according to a "structural perspective", by identifying:

- the intensity and nature of the flows of knowledge and information,
- the characteristics of the nodes, which are the different actors: firms, public administration, consumers, association of people, geographical areas,
- the efficiency of the soft and hard infrastructures or bridging institutions facilitating the interactions,
- the actual form of the networks in the various sectors and city regions,
- the change and long term trends in the form of the networks.

Secondly, knowledge networks in a city region can be analysed according to a "functional perspective", by identifying:

- the stimulus to interactive learning and knowledge creation processes,
- the accessibility between the different actors or nodes,
- the receptivity and attractivity ("tolerance") of these actors or nodes,
- the sharing of a common identity and goals ("social capital") between these actors or nodes,
- the development of creative capabilities based on the original combination of complementary knowledge components,
- the entrepreneurship capabilities and the multilevel governance capable to combine complementary financial and organizational capabilities.

These, six factors are indicated by the TKM – Territorial Knowledge Management approach (Cappellin 2007) and they may serve as the framework in order to identify how the urban spatial structure may affect the knowledge creation process and how regional and local spatial policies may promote the innovation performance of the regional economies (figure 9).

27

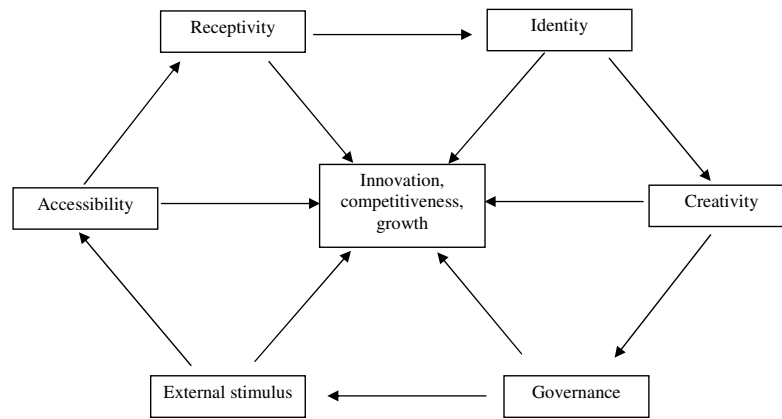


Figure 9: Territorial Knowledge Management as a framework for the governance of regional knowledge networks

These six factors allow to focus the various policy instruments for the governance of the learning networks in a regional or urban innovation system on a limited number of dimensions, which are tightly related to the factors of the processes of knowledge creation according to the literature in cognitive economics.

Promote market orientation and satisfy users needs

New urban needs, public regulations and public expenditure represent a key factor in leading to the adoption and development of new technologies. Technology is driven by the need to solve new spatial problems and by the work of architects and planners. New modern architectures and the building of new modern infrastructures do not only represent innovation in themselves. They also stimulate the use of new technologies, as they drive the development of new materials, which are studied by research in chemistry and nanotechnologies, and also allow the adoption of new organization and management methods in modern office buildings, which lead to the adoption of ICT technologies and facilitate the adoption of new forms of e-government.

Moreover, a driver of innovation is the organization of international fairs, which represent both the space of show and commerce of industrial and agricultural productions and also space of attraction of people and representations of the trends and tastes of millions of clients-users in the world.

Urban agglomerations, being the main source of waste, represent the opportunity for the recycling of waste and for the construction of new plants for thermal exploitation of waste disposal and create new opportunities for the use of modern environmental friendly technologies and stimulate the search of new possible methods for saving energy.

Similarly the high level of pollution in some regions and countries are leading governments to impose constraints on polluting technologies and to allocate financial subsidies to the research and use of non polluting technologies, such as fuel cell cars.

Increase accessibility

New modern transport infrastructures and an increased accessibility provide the opportunity for the creation of new economic activities, especially in most peripheral regions and in the new member states of the European Union. Clearly easier communications are required to facilitate the adoption of new technologies and to the invention of new products.

Moreover, improved transportation facilitate the adoption of Just in Time methods of organizations and the subcontracting by large companies to smaller companies.

Finally, an high transport integration, thorough the creation of new major high speed trains links or the improvement of private and public transports, may stimulate broad alliances and networks between contiguous cities in various polycentric urban regions in Europe (Ruhr area, Brussels–Antwerp, Milano-Torino). That is leading them to plan large joint investments, such as the joint creation of fears, airports and other superior services.

Manage receptivity

The provision by local governments of higher education institutions is increasing the human capital and the receptivity to innovation.

Moreover, cities are characterized by a multi-cultural composition, being the residence of many immigrant from various parts of the world. The wide range of different perspectives and voices may lead to an attitude of receptivity and tolerance, which favour innovation. On the other hand, the process of social integration of the different cultures may be easier in intermediate cities, while in large cities foreign immigration may lead to ethnic segregation and tensions.

Building a common identity

Cities are the locus of major events, such as Olympia games, world championships, major international expositions, which often prove to become the opportunity for mobilizing local actors and institutions in the construction of new major infrastructures and innovations and have a long lasting effect in the image of a given city.

A similar effect is played by modern beautiful architectures which may mark a turnaround and give a new identity to specific decayed areas, such as industrial derelict areas or anonymous peripheral dormitory neighbourhoods, and transform these sites into around-the-clock, live-and-work communities by stimulating a new wave of complementary private and public investment.

Also the location of new university, research institutions and science parks have proved to be of great importance in transforming these areas and improving urban quality.

Lever creativity

Clearly, it is impossible to anticipate creativity. However, it is possible to promote creativity and the support to research institutions may play a crucial role. The creation of universities and research institutions by local governments promotes the development of international relations and the receptivity and openness to external technologies and favour the attraction of highly qualified workers.

In particular, they provide to the firms and institutions of an urban economy an easy access to advanced technologies and qualified professional competencies, which may contribute to increase the competitiveness of these firms and institutions.

Often the relationships between a city and technology is interpreted as the problem of insuring an adequate location to university and major research institutions. In that perspective it seems that innovation promotion implies a further burden to local government finances. However, innovation and research may have indirect and important effects on the urban environment. In fact, these institutions contribute to the development of a well qualified young labour force which is a major factor explaining the growth of innovative activities in the urban areas.

Enhance governance and entrepreneurship

Innovation requires an adequate organization of the various actors involved in this process. Urban planning leads to the creation of policy networks in urban areas. An effective governance requires the existence and integration of various actors, with different complementary capabilities, as also the cultural receptivity of these latter, the flexible organization of negotiation procedures between various different interests. In particular, innovation requires the management of conflicts and to promote the cooperation between various disparate actors.

The size and complexity of urban problems and the renewal of the economy of a region require major investments. The impossibility for local governments to finance alone major investments has led to the adoption of innovative methods of financing, such as "project financing", in the case of

30

power generation, road-building, urban rail and airports. Project financing represents an innovation in public management and it indicates how complex are the factors which affect the adoption of an innovation.

In conclusion, a network perspective to the analysis of the urban areas in the perspective of the transition to the knowledge economy highlights some original characteristics of cities, representing new opportunities, such as:

- high openness to external stimulus related to the easy access to international markets,
- high accessibility related to the advantages of geographical concentration,
- high receptivity related to the availability of highly educated human capital,
- high local identity and social capital related to long dated common history and traditions,
- high creativity related to the diverse and complementary available competencies,
- high governance capabilities related to the existence of powerful and well organized local governments.

However, the network perspective allows to highlights some strategic problems in urban areas as the development of knowledge and innovation networks and the process of interactive learning and knowledge creation may be hindered in urban areas by the existence of:

- many new but only scattered needs and segmentation of the local markets of new goods and services,
- low accessibility due to traffic congestions,
- low receptivity due to differences and too high cognitive distances, tensions and conflicts,
- low common identity due to deep diversities and fragmentation and an high mobility/turnover of population,
- low creativity due to short term commercial attitudes and lack of long term commitment,
- low governance capabilities due to lack of coordination and the fragmentation of the many decision making bodies.

In fact, the creation of knowledge not only leads to innovation and increasing economic competitiveness, but it is also tightly related with a process of increasing fragmentation and concentration within the individual city-regions.

The evolution of the knowledge networks may have an impact on the sustainable development of the city-regions, the trade-offs between efficiency and equity and new forms of unbalances, such as those by skills, age and gender.

The evolution of cities to the knowledge economy

The process of transition of cities and urban areas to the model of the knowledge economy implies the tight interaction of four major policy areas (figure 8). These represent a challenge for future urban research.

31

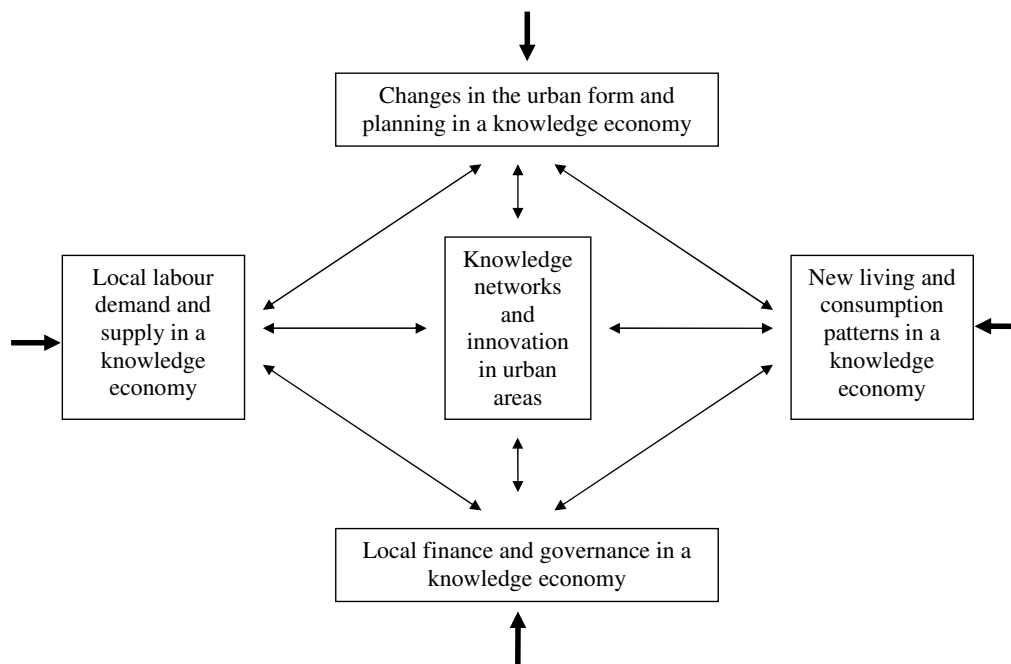


Figure 8: Four policy areas in the evolution of cities to the knowledge economy

Source: Cappellin, R. (2007), KNOWCITIES, The role of city-regions and of urban policies in the knowledge economy, Proposal for a FP7 Project, IULM University.

Local labour demand and supply in a knowledge economy

Knowledge and innovation networks within an urban area and between urban areas in an international framework determine a strong economic integration between the industrial and the service firms and between the various service firms within a city-region. Urban factors affect the demand and the supply of knowledge intensive services (KIS), addressed not only to the firms (KIBS) but also to the people (KIPS).

That determines changes in the labour demand by the firms, the levels and characteristics of the labour supply, the employability of the workers and the forms of cooperation between qualified workers ("knowledge workers") within professional association and communities. Key issue is the connection between the supply of labour, characterized by new qualifications and professional curricula, and the labour demand by firms, characterized by increasing requirements on flexibility, relational skills, intersectoral openness, autonomy and self-responsibility.

Within a city-region economy knowledge networks, interact not only with the networks where the flows of products and services circulates and the and the the networks of labour mobility, but also with other different networks, such as, the network related to financial control between firms, the policy networks and institutional relations.

Moreover, the knowledge networks and the economic networks working at the local level interact with the correspondent networks at the interregional and international level, as indicated by flows of exports, imports, immigration, foreign investments and national/European public funds and policies.

Strategic fields of research and policy intervention are the development of innovation within KIS, the increasing importance of "knowledge workers", the increasing knowledge intensity of traditional occupations, the interactive learning processes leading to new skills, capacities, and forms of tacit knowledge, the increasing professional mobility of knowledge workers. That leads to the need for new local lifelong education policies, specific organizational frames for strategic knowledge networks and new governance forms.

The evolution to the knowledge economy implies new forms of unbalances, such as those related to the increasing specialization and differentiation of economic activities and the complexity of production networks and a trade-off between increasing efficiency and the adoption of innovation on one hand and the effects on equity on the other hand. Important resistances to change may be determined by the increasing divide between insiders and the outsiders in the urban labour markets or between young, adult, and senior workers, between men and women and between skilled and unskilled workers. A better understanding of these challenges is necessary to overcome the tendencies towards segregation in many European city regions and to exploit the wealth of intercultural diversity and experiences within these regions.

New living and consumption patterns in a knowledge economy

The evolution of cities to the knowledge economy implies new emerging needs by the households and individuals and the new demand of private and public services/goods as the result of the greater "knowledgeability" of users. In fact, an increased culture and knowledge level of the city-region population determines new job preferences by the workers, a different leisure/work trade-offs and it may increase the demand for specific new

collective or public goods. The effect of higher knowledge may be that to further differentiate the preferences of users, as they are related to gender, age, income, national origin characteristics and/or to differentiate these preferences with respect to people having lower levels of knowledge.

The new urban life styles and needs promote the spin-offs of new economic activities in service and industrial sectors and the development of new activities which may later be exported to other areas and countries.

The development of new goods/services is usually the result of an effective interaction and co-production between the user and the producer. New life styles and consumption patterns have a collective character and are tightly related to the interaction between the various consumers and citizens in the city-region and in some cases new products/services emerge initially as a self-production within the framework of specialized associations or communities of interest.

There are many case studies on new forms of private communities and initiatives in Europe with different backgrounds. Local and regional policies may incentive private communities to organize themselves within the city regions and adjust public procurement policies to encourage new forms of consumption.

However, within city-regions the increasing specialization of economic activities is also accompanied by an increasing segmented plurality or divides of living and consumption patterns and often by too little cultural and social integration and an increasing fragmentation.

The upcoming demographic changes have an impact on the demand for local public goods and their finance. Local and regional policies should address these types of fragmentation and identify the characteristics of crucial factors in regional collective goods to improve social inclusion, e.g. by organising specific childcare and education services, creating incentives for private social services and caring for elderly people.

Moreover, new living and consumption patterns in a knowledge economy diffuse from one city-region to other city-regions in a national and international framework. Different European city-regions indicate interesting disparities and different patterns of evolution. The structures of knowledge networks are different in the various city regions and European policies should aim to encourage the emergence and diffusion of knowledge between the regions and, in particular, identify how gatekeepers in different network types can be connected.

Changes in the urban form and planning in a knowledge economy

The evolution toward the knowledge economy implies changes in land use pattern and in the spatial shape of city-regions. In fact, the insights on the changes in the social and economic factors of urban viability allow a better understanding of the dynamics of urban territory. The knowledge economy and technological change have an important physical impact on the organization of territory or of the built environment in urban areas. On the other hand, urban policies may affect the pattern of the process of knowledge creation and innovation.

34

The various cases of strategic urban planning and new urban projects in each European city-region address and promote these changes. Traditional patterns of separation between social groups, between living and working or between working and consuming have to be overcome to satisfy the needs of the knowledge society. Accordingly, incentive patterns for land use have to be adjusted in the local policy of the city regions.

The city-regions are characterized by increasing mobility of labour in terms of commuting and jobs, families, and housing. Moreover, the evolution to a knowledge economy leads to the need of modern transportation and communications infrastructure in various sectors, in order to increase the attractiveness of the urban economy to qualified workers and new sectors. The attractiveness of the city regions increasingly depends on the capability of these modern infrastructures to comply with the call for better environmental quality and with the aesthetic ambitions of the firms, communities and individuals in the cities. Thus, new styles in architecture and infrastructure design have to be considered and encouraged.

The enlargement of scale of and scope of urban spaces characterizes the changing shape of city-regions, exemplified by an increasing segmentation of land use within each city-region and the emergence of new in-between urban/rural spaces. New form of territorial unbalances may emerge, such as spatial segregation and problems in urban peripheries. Indeed, population and employment sprawl is far from uniform. A large proportion of employment growth in the periphery is becoming agglomerated in a small number of "specialized peripheral poles" giving rise to "monocentric specialized multipolar" urban pattern (Bourdeau-Lepage & Huriot, 2005). This phenomenon is quasi-universal (Anas et al., 1998) and is reshaping noticeably urban economic space.

Local finance and governance in a knowledge economy

The evolution toward a knowledge economy and the changes in the urban economic-social-cultural system imply the search for new forms of urban governance. These new governance forms must aim at greater public participation, for the development of interconnected strategies based on goals and policy integration and for the changes in the allocation of local public finance. Key problems, which may , which may hamper the spreading of knowledge economy, are linked to labour qualification, territorial planning, living and consumption patterns, governance, and competition with the others European capital regions.

In fact, the role of local institutions and local governance is crucial, as "social capital" is a key factor in promoting interactive learning, creativity, and innovation. The ability of organizations to learn, assimilate and use new or existing knowledge created elsewhere is essential and determines their level of innovation. The absorption capacity depends especially on the linkages between organizations like firms, universities, and government agencies, and technology-transfer agencies. The quality of interactions is crucial in the process of innovation and knowledge creation. These interactions are determined by the institutional context, the character of the governance system, and the quality of the social capital. Institutions, governance, and social capital are interrelated concepts. Indeed, institutions, understood as the set of formal or informal rules of the economic and social games (North, 1990) will condition the intensity and the quality of interactions, and consequently the creation and diffusion of knowledge and/or information.

Governance, defined as "the sum of the ways through which individuals and institutions (public and private) plan and manage their common affairs" (Unchs, 2001, 90), generates either conflicts or beneficial cooperation. It includes formal institutions and relates closely to social capital. The concept of social capital (initiated by Putman, 1993) refers to the collective dimension of all rules and norms, of the spontaneous social interactions permitting

35

the coordination of actions and the cooperation within groups or between them, in order to reach social cohesion and the pursuit of common goals. It depends on historical and cultural factors, on institutions as rules of the social game, but also on the governance structure, on its efficiency to mobilize and coordinate technological and human resources in order to build a knowledge-based economy (Coleman, 1988; Field, 2003; Maskell, 1999).

Strategic learning requires the exploration of wider horizons and of new policy strategies in a multi-actor and multi-level governance context. Public policies should promote connectivity and an active civic participation by the various segments (as defined by skills, age, gender and nationality) of the urban economy and society, through the experimentation of democratic innovation, innovative alliances, and strategic coalitions, avoiding the limits of formal participation or of technocratic decision-making. Modern policies in city-regions require the crossing of the borders between public and private sectors and the crossing of the borders of contiguous administrative jurisdictions and different but complementary policy sectors.

Various policy problems related to the transition to the knowledge economy are: the financial crisis of urban governments, the impact of the different public current and investment expenses on the diffusion of innovation and the creation of urban innovation networks. That indicates the complementarity and the competition between a neo-liberal approach and a multilevel governance approach in the provision of public services, the need for the coordination of urban industrial policy with labour policy, education and welfare policies, as well as physical planning.

The process of internationalisation of the economy is different for private and public sector. The private sectors (both production and consumption) cross the regional and national scales easier than the public sector. On the contrary, public sector strategies focus on integration but are rather introverted. However, local governments should consider the compatibility with supra-regional policies and the launch of major urban projects may affect the international competitiveness of the city-region.

A network perspective in the analysis of urban problems in a knowledge economy

A network perspective highlights some original characteristics of cities, representing new opportunities, such as:

- high openness to external stimulus related to the easy access to international markets,
- high accessibility related to the advantages of geographical concentration,
- high receptivity related to the availability of highly educated human capital,
- high local identity and social capital related to long dated common history and traditions,
- high creativity related to the diverse and complementary available competencies,
- high governance capabilities related to the existence of powerful and well organized local governments.

However, knowledge networks and the process of interactive learning may be hindered in large urban areas by the existence of:

- many new but only scattered needs and segmentation of the local markets of new goods and services,
- low accessibility due to traffic congestions,
- low receptivity due to differences and too high cognitive distances, tensions and conflicts,
- low common identity due to deep diversities and fragmentation and an high mobility/turnover of population,
- low creativity due to short term commercial attitudes and lack of long term commitment,

36

- low governance capabilities due to lack of coordination and the fragmentation of the many decision making bodies.

The relationships between the four thematic areas

The previous four policy fields in the transition of cities to the knowledge economy:

- L – labour,
- T – territory,
- C – consumption,
- G – government,

are tightly connected by interdependent relationships. These are some examples:

- T-L: the transformation into a knowledge economy is accompanied by the adoption of modern just in time organization, an increase of people mobility and transport congestion and this latter may decrease the agglomeration economies of a large city-region with respect to smaller urban centres.
- C-L: the more complex social composition and the higher level of education lead to an increase of creativity and of the innovation potential of the economy in the city-region, as well as to a greater preference for non-manual jobs.
- G-L: new regulations may be the stimulus to the adoption of modern non-polluting technologies, thus increasing the opportunity for the creation of innovative firms and sectors. Clearly greater public investments in higher education lead to an increase of qualified workers and facilitate the adoption of innovation.
- C-T: the increase of shopping and leisure activities lead to an increase mobility and traffic congestion and new living standards lead to different housing preferences.
- G-T: modern governance allows the creation of policy networks and the launch of large urban projects, which may be then the drivers of further private investments.
- G-C: large public project may be preliminary to the creation of new identity or a re-branding of the city-region and lead to a greater cooperation between local actors and further demand of collective services.

37

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39

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