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Jari Kolehmainen

Knowledge Institutions in the Local Innovation Environment: Case Digital Media Agglomeration in Tampere

Introduction

Innovation and learning appear increasingly crucial to the success of firms and localities. Very broadly speaking, focusing on these matters is the only way for companies to succeed or even survive in the globalising economy. Schienstock and Hämäläinen (2001) conclude that innovation is a recursive process which concerns all activities from the search for a solution to technical or other problems to a situation in which a new product or production process has been launched on the market (see also e.g. Schienstock & Kuusi 1999). They also emphasise that the concept of innovation should not be restricted only to technical innovations (e.g. new products and technical enhancements of production processes), because social innovations – including organisational, procedural and institutional innovations – are of great importance. The notion of the significance of institutional innovations links this innovation approach directly to the local and regional economic development and innovation policy.

Companies are not alone in this, because regions and nations are also under the same pressure. In the global network economy, localities and regions compete with each other and, according to a modern scientific view, regions are trying to catch their share of global capital, investments, inhabitants, etc (see. e.g. Kostiainen 1999; Sotarauta & Linnamaa 1997; Cooke & Schienstock 2000). The focus in debate concerning the regional development has lately been quite strongly on external competitiveness. In

addition, attention should be paid to the internal or endemic development dynamics of localities and regions. However, from innovation activities point of view, these two issues do not differ that much: an externally competitive locality or region is usually dynamic also in its internal development.

Improving competitiveness and creating innovations are common challenges to companies and regions alike. This common challenge culminates in companies' local operational environment. It can be argued that a good local innovation environment can have a positive effect on the innovation potential of firms. At the same time, a good local innovation environment increases the external competitiveness of a locality. Consequently, it is natural that local authorities are taking actions that aim to enhance local companies' possibilities to innovate. Increasing attention has been paid to this particular dimension in the ensemble of the local business development policy. This dimension can be called regional or local innovation policy. It is good to remember, however, that regional innovation policy is often rooted in national and regional science and technology policy. Support for the development of local knowledge institutions constitutes an important part of local or regional innovation policy.

In this article, the role of knowledge institutions as part of the local innovation environment is discussed. The concept of knowledge institution refers here especially to the educational and research institutions and other institutions that are closely linked to them, such as science parks and so-called special development organisations. Moreover, some future challenges are highlighted and, from this angle, some broader innovation and economic development issues are dealt with. The empirical part of the article is based on the research project 'Networks, Innovation Milieus and Regions' (VIA¹). The article is organised as follows. First the concept of local innovation environment

is introduced and then the role of the knowledge institutions within it is discussed. After the theoretical discussion, the case of a digital media agglomeration in Tampere is dealt with to provide an empirical illustration of some of the theoretical issues. It has to be underlined that the empirical data do not allow in-depth evaluative analysis of the knowledge institutions of the digital media agglomeration in Tampere. In the end some concluding remarks are presented.

The concept of local innovation environment

Territorial agglomeration as a basis

Economic activities seem to have a tendency to concentrate on some locations and this holds true also for the new knowledge-intensive activities and for the activities of the so-called 'new economy', for example. This phenomenon can largely be explained by the classical agglomeration economies. In this article, the concept of territorial agglomeration refers to the spatial accumulation of economic activities of the same kind, more specifically the accumulation of companies belonging to the same branch or industry and immediate branches or industries in a certain geographic locality or region. However, in the sense of geographical scales, it is used very flexibly, which could also be a problem from the point of view of empirical research. In the Finnish context, it is relevant to focus on city-region-wide territorial agglomerations, which consist of a significant number of companies belonging to the same branch or immediate branches and which are of great importance from the point of view of the regional economy (cf. Kautonen & Kolehmainen 2001, 94–95). Accordingly, the concept of territorial agglomeration in this paper refers to relatively local economic activities.

The basis of a territorial agglomeration is usually formed by the agglomeration economies – external to all companies – which

exist because of geographic proximity even in a competitive environment. These classical and most obvious reasons can be summarised as follows (cf. Marshall 1890/1920; Krugman 1991; Gordon & McCann 2000; Arrow 1962; Porter 1990):

- *decreasing transaction costs* (e.g. transportation and communication costs)
- *specialised local labour force* (e.g. decreasing search costs and accumulation of human capital)
- *branch-specific resources and infrastructure* (e.g. specialised services and presence of demanding local customers)
- *maximal flow of information and ideas* (e.g. mobility of labour, knowledge spillovers, informal contacts between companies)

Three levels of local innovation environment

The territorial agglomeration is usually a basis for the local innovation environment. In other words, the agglomeration economies, especially those related to the branch-specific resources and infrastructure and the information flows, are essential elements in the localised innovation activities of firms. However, the concept of local innovation environment takes also other factors and elements into account from that perspective. These factors and elements should be analysed on three different levels: *1. the structural and institutional level*, *2. the level of organisational relationships* and *3. the level of individuals*. Each level has certain characteristics and dynamics that are necessary to make a local innovation environment (e.g. territorial agglomeration) innovative. A brief presentation of these three levels is provided on the following, with emphasis on the structural and institutional level.

The structural and institutional level. The basic business and institutional structure of the agglomeration has a significant

influence on its dynamics, also from the point of view of innovation activities. Therefore, when analysing a local innovation environment, attention should be drawn at least to the following factors and elements: the number and nature of companies and business units, educational institutions, science and technology base (e.g. universities, research institutes and private R&D units), specialised private, semi-public and public business services (e.g. financing, consultancy, technology transfer and incubation services) and interest groups (e.g. trade and entrepreneurial associations, chambers of commerce), and local authorities. When considering the institutional setting, the concepts of local *institutional density* and *institutional thickness* become very interesting. These concepts refer to the local presence of numerous different institutions collaborating synergetically to attain a somewhat common goal, guided by partly shared norms, values and understanding (cf. Amin & Thrift 1996; see also Powell & DiMaggio 1991). The role of institutional thickness in more general terms in the development of high-tech clusters has been recognised also in empirical studies (see e.g. Keeble & Wilkinson 2000), although the role of formal (e.g. public) institutions is not always very strong or direct (cf. May et al. 2001). The institutional approach emphasises the role of non-organisational institutions and, in this perspective, institutions can be understood as ‘rules of the game’ (see e.g. North 1990). However, in this article, the emphasis is on organisational institutions.

The level of organisational relationships. A city or an agglomeration does not innovate by itself, but it can support the innovation activities of organisations. The structural and institutional setting of a local innovation environment forms one possible basis for these activities which are increasingly inter-organisational and network-based in nature. Consequently, when analysing the local innovation environment from the point of view of companies, attention should be drawn to the presence of

demanding customers, advanced suppliers and subcontractors, technology and other partner companies and universities and research institutions, for example. Naturally the local presence of these kinds of organisations is not enough, because their nature (e.g. the level of know-how, ability to co-operate and resources) determines whether or not there is opportunity for mutually synergetic co-operation. In addition to co-operative local inter-organisational relationships, local competition between different organisations, mainly between companies, can stimulate innovation activities.

The level of individuals. Inter-organisational relationships can to some extent be reduced to relationships among individuals working in organisations. This notion set up the argument that the role of individual people is very remarkable in local innovation environments. The social nature of inter-organisational relationships is only one dimension of the role of individuals, because skilled workers and experts usually have extensive, work-related personal networks which facilitate the seeking of rare, reliable, or in other ways valuable information and knowledge, for example. From the spatial point of view, it can be argued that proximity does matter in the formation and utilisation of these individual contacts despite the advanced information, communication and transportation facilities. However, from the point of view of individuals, the local innovation environment cannot be reduced to a mere 'platform' for localised social networks and relationships. There are also other dimensions. For example, for the individuals, the local innovation environment should also be 'a creative problem-solving environment', which is a concept that refers to the presence of diverse and high-quality career and further education opportunities (see Raunio 2001).

A closer look at knowledge institutions

The role of educational and research institutions

Based on several empirical studies, Cooke (2004) argues that there are two types of a Regional Innovation System (RIS), namely the Institutional (IRIS) and Entrepreneurial (ERIS). It can be argued that the IRIS is usually characterised by intensive R&D activities, incremental technological innovations, close user–producer relationships and network collaboration. Correspondingly the ERIS is characterised by serial start-ups, supply of venture capital and possibly disruptive innovation activities. According to Cooke's (ibid.) view, the regional innovation systems consists of two subsystems, the 'Knowledge Generation' and 'Knowledge Exploitation' subsystems. This very rough division provides a good starting point for further analysis.

The educational and research institutions – the core of the knowledge generation subsystem – are seen as increasingly important actors in societal and regional development due to a variety of reasons. On the most general level, the so-called information society development raises the educational and research institutions in the focal point. On the one hand, this development manifests itself in the increasing demand for new information and knowledge that is developed within research and development activities. On the other hand, higher education institutions are considerable producers of human skills and competences. However, the societal role and position of educational and research institutions is changing. For example, there is a development trend that erodes the traditional institutional boundaries between the industry, government and (higher) education and research institutions. In research and development activities, multifaceted inter-organisational networks and hybrid organisations involving researchers and experts from science, governmental and business sectors come to

the core. In this respect, the notions of a 'new mode of knowledge production', 'Triple-Helices' and 'entrepreneurial universities' have been dealt with (see e.g. Gibbons et al. 1994; Etkowitz & Leydesdorff 1997, 2000; Etkowitz 2003).

These academic debate items have also their practical societal and policy counterparts. For example, the debate on the universities' 'third commission' has been very vivid in Finland. The 'third commission' refers to the intensification of relationships between universities and the ambient society. It is not only about the economic exploitation of academically produced knowledge (e.g. commercialisation) and university-industry interaction, but it refers to broader effects of universities' basic activities which are scientific research and education based on that. In that sense, the 'third commission' is not a separate commission, but a view on the universities basic activities (for more, see e.g. Virtanen 2002; Kankaala 2004). In many cases the 'third commission' is linked to the role of universities especially within their own regions and to the potential that universities have in terms of regional development. From this perspective, the regional innovation activities are of great importance.

It can be claimed that the role of educational and research institutions – the core of the knowledge generation subsystem – is especially important in local innovation environments based on high-tech-related or knowledge-intensive agglomerations, in other words, 'technopoles' (cf. Gibson & Stiles 2000). Kautonen et al. (2002, 196–198) have dealt with this issue from the point of view of regional innovation policy. They argue that there are two basic development concepts, visions or models concerning regional innovation policy. These concepts are the 'Technopolis' and the 'Learning Economy'. Nevertheless, these two models should not be seen as mutually exclusive but complementary. The Learning Economy Model focuses on interactive learning and innovation processes, which may not only be more incremental

but also continuous by nature. This model aims to enhance the competitiveness and surviving preconditions of all types of regions and industries by building their innovation capabilities. The Learning Economy Model covers all the branches (e.g. traditional industries and services) and can therefore be applied in small towns and rural localities.

Correspondingly, the Technopolis Model is appropriate for the development of high-tech and knowledge-intensive branches and agglomerations. Consequently, this model is mostly applicable regionally in large university cities and in high-technology and knowledge-intensive industries. This policy model is based on more traditional, linear technology-push processes. The basic idea in this model is to create and commercialise global top expertise in certain science and technology niches. The commercialisation process should be effective and competitive on a global scale so that the locally produced technology and expertise creates new wealth and jobs in the region. Therefore, a strong science and technology base is fundamental, but not enough. There should be different kinds of 'management competences' locally available, so that the technology and ideas develop into new products and services. Typical innovation policy concerns in this model are related to technological entrepreneurship, the availability of R&D finance and risk finance (e.g. venture capital), immaterial property right issues and the internationalisation of the companies (Kautonen et al. 2002).

The models introduced above are naturally over-simplifications. It was mentioned that the Technopolis Model is based on the linear innovation model, the 'cascade model'. However, this view must be elaborated further, because the innovation processes of high-technology and other knowledge-intensive companies are usually interactive in nature. This means that also university-industry linkages are two-way and companies do not only use and commercialise the knowledge produced in

universities, although, according to empirical research in the Finnish context, companies consider the commercial utilisation of knowledge, acquiring new scientific knowledge and monitoring technological development as the most important goals for university collaboration (Nieminen & Kaukonen 2001).

Kolehmainen et al. (2003) deal with the role of educational and research institutions in their location regions from a broader standpoint. They suggest that these institutions can have at least three different roles: 1. *the anchor*, 2. *the dynamo*, and 3. *the magnet*. An educational or research institution has the *anchor role* if it is able to tie up the (key) companies in the region by creating versatile and intensive collaboration relationships (e.g. joined research projects, educational planning) with them. Respectively, the institution has the *generator role* if its activities generate new businesses by commercialising the results of basic or applied research (e.g. spin-off companies and joint ventures). Pioneering educational activities can also significantly stimulate the entrepreneurial activities. To fully utilise the generating potential of educational or research institutions, the entrepreneurship-supporting services and mechanisms (e.g. incubation services, finance, consultancy in intellectual property rights) should be available and of high quality. The *magnet role* of an educational or research institution refers to situations in which the institution is able to attract external (foreign) investments into the region because it has unique or otherwise special research and educational activities. The magnet role can be supported regionally by taking care of the issues considered in the typical investment decision-making processes (e.g. supply of business services and suitable premises, subsidies) (Kolehmainen et al. 2003).

In conclusion, the economic significance of educational and research institutions is very considerable and it is growing. However, the direct contribution of the universities (and

other educational and research institutions) to the companies' innovation activities should not be exaggerated (see e.g. Revilla Diez 2000). It is also important to notice that different companies have different needs and capabilities with respect to collaboration with these institutions. For example, small and medium-sized companies (SMEs) are different from large corporations. Not even all the SMEs are alike, but they can be at different levels of sophistication in terms of innovation as Benneworth and Dawley (2004) points out. They also stress the fact that universities may require multiple responses to ensure that companies at all sophistication levels can access the innovation support assets and capacities within the universities. The responsibility of making these assets and capacities more available to different kinds of companies lies also partly on the so-called specialised development organisations that are dealt with next.

Specialised development organisations in a local innovation environment

Contextualising science parks in a local innovation environment

Science parks as an element of the local innovation environment can be approached from two perspectives that augment each other. First, they can be seen as a part of territorial agglomerations described above. Consequently, attention should be paid also to the so-called micro agglomerations that can be seen as a kind of special 'condensations' within territorial agglomerations. Kautonen et al. (2002) define a micro agglomeration as a group of companies and other organisations that is geographically concentrated in some certain definable area and that has frequent internal interactions. Science parks and technology centres are typically these kinds of micro agglomerations, although they can result also from other kind of processes, such as a physical

concentration of an industrial plant and its subcontractors. In any case, it is necessary that the organisations perceive themselves as members of the micro agglomeration. It is also important that the 'membership' bear some benefits to the organisations belonging to the agglomeration. However, these benefits can be highly varied: cost advantages, information sharing and knowledge spillovers, image and visibility, etc.

Second, the science parks are usually a crucial part of the institutional setting of the local innovation environment. Cooke (2004) states that in many cases knowledge generation and exploitation subsystems of regional innovation systems are linked together quite weakly. It can be argued that the local innovation environment has the same subsystems as regional innovation systems, although the approach is slightly different. Cooke (ibid.) points out that different regional innovation systems have different linking mechanisms and organisations. In entrepreneurial innovation systems venture capitalists are in the key role also in this respect, whereas in institutional innovation systems some public organisations or agencies bridge these two subsystems. Cooke (ibid.) introduces different kinds of 'boundary-crossing' instruments in regional innovation systems. He concludes quite strongly that all the different 'boundary-crossing' institutions should be outside direct public sector control, because *'all involve some degree of risk-taking that functionaries are by and large neither trained nor competent to perform'*.

It should be stressed that this division of organisations and other actors into two broad categories is very artificial, because most of the organisations are 'knowledge generators' and 'knowledge exploiters' or 'knowledge users' at the same time. This notion is quite obvious, especially from the point of view of interactive innovation approach. However, a part of the institutional setting of the local innovation environment, as described above, belongs to the knowledge generation subsystem

and a part belongs to the knowledge exploitation subsystem. Still, many of the organisations belonging to the institutional setting of a local innovation environment act as links between these two subsystems. Science parks are usually seen as these kinds of institutions.

Science parks were a hot topic in research in 1980s and early 1990s, because the concept was new at that time. At that stage, many different concepts and terms delineating the same kind of arrangements and developments emerged. Still there are several slightly different terms used to describe similar arrangements, such as 'Technology Park', 'Business Park', 'Research Park', 'Innovation Centre', 'Technology Centre', 'Technopoles', etc. (cf. e.g. Monck et al. 1988; Castells & Hall 1994). In addition, the term 'Technology Centre' is used. Usually these concepts refer to enterprises based on real estate businesses that aim at fostering the formation and growth of knowledge-based branches and increasing the number of these kinds of knowledge-intensive companies. In other words, the basic idea is to accumulate knowledge-intensive organisations in a certain location to boost innovation and entrepreneurship. Additionally, close operational relationships to universities, public research institutes and other higher education institutions are a crucial part of the concept of science parks and technology centres. Some of the science parks are thematic in the sense that they host and provide services only for companies belonging to a certain branch or cluster.

There is a plethora of evaluative studies on the effectiveness of science parks, especially from the point of view of new company formation, incubation activities, support for (technology-based) SMEs and networking building (see e.g. Joseph 1994; Vedovello 1997; Mäki & Sinervo 2001; Colombo & Delmastro 2002; Löfsten & Lindelöf 2003; Chan & Lau 2005). These evaluative studies are usually quite restrained concerning the actual effectiveness of the science parks. For example, in many

cases, only few statistically significant differences can be found, although usually the science park companies seem to be better off than similar companies outside science parks. According to these studies, science parks seem unable to generate all the benefits to companies located in them that they are expected or claimed to produce. For example, the role of networking and clustering within science parks is usually exaggerated. In addition, science parks are criticised also from other points of view. For instance, Massey et al. (1992) argue that science parks promote social polarisation in geographical terms by decoupling scientific production and technological development work from physical production.

In conclusion, from the point of view the local innovation environment, the role of science parks is twofold. First, they are some kinds of 'micro agglomerations' that have their own internal dynamics also in the terms of innovation and new company formation. This is the case especially in the 'thematic' science parks or technology centres. In this respect, science parks are a crucial part and a kind of crystallisation of the local innovation environment. Second, the companies and other organisations running science parks are in many cases in charge of development activities and projects that are not directly linked to the science parks or companies and other organisations locating in them. Consequently, instead of focusing on the science parks only as physical, geographical ensembles, increasing attention should be based on the development organisations that are somehow linked to the science parks. These organisations are usually so-called specialised development organisations. There are also specialised development organisations that are not based on real estate business. These organisations together are an important element in the institutional setting of a local innovation environment and that is why they are examined in more detail.

Specialised development organisations and their activities

Development organisations are organisations whose mission is to facilitate the development of the whole region or locality or the development of certain remarkable sector of that region or locality. These organisations may have this mission ‘by definition’ (e.g. many regional state agencies or agencies established by the local government) or they may have this kind of mission because they want to contribute to the development because of their internal aspirations and motives (e.g. many universities and educational institutes). In general, different kinds of development organisations have activities and offer services that can be described as ‘boundary-crossing’ or ‘boundary-spanning’ activities. It can be argued that the dimension is not as important for all the development organisations but for those which can be characterised as specialised development organisation.

Namely, according to Sotarauta (2000), development organisations can be divided into two groups: 1. *general development organisations* and 2. *specialised development organisations*. The general development organisations are responsible for the development of a region in its entirety and they should be able to analyse the forces affecting the region as well as to allocate the development resources to the most important targets. Cities, municipalities and regional councils are typically this kind of general development organisations on the regional or local level. The general development organisations can direct the activities of specialised development organisations by financing and goal setting. On the other hand, the specialised development organisations can direct to some extent the regional development work as whole by their own actions (Sotarauta 2000).

Correspondingly, specialised development organisations’ task is to develop a certain sector or branch of the region. The main task of the specialised development organisations is usually to act

as an intermediary between and among companies, educational and research institutions and general development organisations. For instance, they channel information and knowledge, skills and financial resources. To be capable of acting as an intermediary, the specialised development organisations have to have a very good understanding of their own field, both in terms of the nuanced substance and from the more general point of view. In other words, they are network weavers that try to combine the resources and competences of different actors for the benefit of the particular field they are responsible for (Sotarauta 2000; Sotarauta & Kostiaainen 2005). Many specialised development organisations can be labelled as intermediary organisations due to their intermediary role.

In Finland, specialised development organisations are usually established to respond the local needs that differ naturally from each other. Usually these organisations are ‘implementation tools’ of local and regional economic development and innovation policy. Also their juridical forms vary. Some of these organisations are public authorities, some publicly owned companies, some public-private partnerships and some even totally privately owned companies. This means that they are not all under the same kind of political control and tutelage. Consequently, the specialised development organisations are not in the same position in terms of funding either. For these reasons the field of specialised development organisations is very heterogeneous, which is possibly a problem from the central government’s point of view. It may be a problem because these organisations are also important actors in terms of national innovation policy. In this respect, it has been suggested that the central government bodies should pay attention in more unified way to these specialised development, or in other words, intermediary organisations to make the local, regional and national policy making more efficient and effective (cf. Koskenlinna 2004). In principle,

this is a good aim, but the increasing national co-ordination should not cause any hindrances to the natural development of the specialised development organisations (for more about intermediary organisations in Finland, see Koskenlinna 2004 and Koskenlinna et al. 2005).

Some of these specialised development organisations can be described distinctively as ‘cluster organisations’, whose main aim and responsibility is to organise cluster activities, for example by removing barriers to collaboration and arranging meetings (cf. Lagendijk 2000). Correspondingly, the cluster activities are specific events in which clustering, especially collaboration in innovation, can take place. Consequently, clustering can take place also without the contribution of cluster organisations, but they may facilitate the emergence of clusters considerably. These kinds of cluster organisations usually implement in practise the cluster policies which can be divided into three classes: 1) *support for existing clusters*, 2) *support for businesses that already collaborate* and 3) *establishing new collaborations between non-co-operating businesses* (Benneworth et al. 2003).

The activities or services provided by the specialised development can be roughly divided into two categories: 1. *support services for companies* and 2. *boundary-spanning activities for many kinds of actors*. First, the internal support services are usually aimed at people (e.g. university researchers) with a business idea, newly established companies or more mature companies that have some problem or that are seeking for a new mode for the business. The two first-mentioned customer groups usually require so-called incubation services. In practise, the typical support services are as follows:

- evaluation of business plans
- evaluation of technologies and patents
- support for commercialisation of existing technologies and business ideas

- support for technology projects, project planning and management
- market research
- basic business counselling
- in-depth consultancy (e.g. strategy, legal issues, finance)
- educational activities and personnel training (e.g. training programmes for companies within the same branch)

These services are typical knowledge-intensive business services in the sense that they are delivered in close collaboration between the service provider and the customer. In many cases, active participation and openness is needed from both sides. The business environment of many new technology-based or other knowledge-intensive companies is usually very complex including considerable technological and financial risks. Most of the new companies aim at very narrow market that may have very specific characteristics and dynamics. In addition, new technology-based or other knowledge-intensive (e.g. expertise-based) companies suffer usually from the so-called competence gap, which refers to the lack or weakness of management capabilities related to issues such as sales, marketing and finance. Because of these features, provision of even very basic evaluation and consultancy services requires quite special skills and sensibility to the specificity of the companies and business ideas. These services are usually financed either by direct customer fees or public funding (e.g. the basic evaluation of business plans).

Second, the other field of activities of the specialised development organisations can be named as boundary-spanning activities. They could also be named networking activities, but the term boundary-spanning describes quite well the challenge of getting actors with many kinds of needs and motives to

collaborate together. Specialised development organisations can be mediators between or sometimes within the following groups:

- companies within the same branch (e.g. personnel training)
- subcontractors and main suppliers (e.g. development of subcontracting networks and ‘mini-clusters’)
- suppliers and end customers (e.g. marketing, sales promotion)
- companies that have complementary competences (e.g. technological partnership, development of ‘mini-clusters’)
- universities, research institutions and polytechnics and companies (e.g. licensing, technology transfer, collaborative projects)
- companies and financiers (e.g. finance of R&D activities, ‘V2C activities’)
- universities, research institutions and polytechnics (e.g. joint teaching activities, collaborative research projects)

The above list is not exhaustive, but the field of the specialised development organisations can be vast. These activities require special skills in areas such as networking and project and process management and a good sense of needs and expectations of different actors. General networking or cluster development activities and projects are usually financed mainly by public funding. The specialised development organisations provide also boundary-spanning services that are company-specific and thus chargeable.

Case: A digital media agglomeration in Tampere

Basic description of the agglomeration

The roots of digital media agglomeration² in Tampere go far back in history. In the early 1990s, there was only a clutch of separate companies in various branches that were loosely related to each other. After that the agglomeration grew very rapidly and reached its current form in the late 1990s. Also, many new business activities and companies emerged. For example, the ‘Internet revolution’ in the mid-1990s generated the new media business which has thereafter transformed drastically. It has even been claimed that there is no more such thing as new media. However, different digital-media-related branches have been growing rapidly and they have gradually come closer to each other – converged – forming an agglomeration, which is still quite loose and multifaceted.

In 1996, the agglomeration consisted of approximately 170 companies and business units with a total of 5,200 employees, when its total turnover was about 770 million euro. In 2000 the total turnover had doubled, amounting to 1.5 billion euro. The number of employees in private companies also increased rapidly. For example, it grew from 3,000 to 6,800 between 1994 and 1997, which means that the growth rate was approximately 125 per cent (*Tampereen seudun osaamiskeskusohjelma 1999–2006* 1998). By 2000, the digital media agglomeration employed 10,000 people (O’Gorman & Kautonen 2001). If the agglomeration is defined in broader terms (including e.g. all mass media and ICT wholesale and retail), the number of employees amounts to some 15,500. At the beginning of twenty-first century, the development of the agglomeration in terms of employment has been positive, but fairly slow. In comparison, the number of employees in the ICT sector has decreased during the last couple of years in Helsinki and Oulu. Relatively, the

development of agglomeration in Tampere has been quite good. In the near future, modest growth is the most likely scenario (cf. Mäkinen et al. 2004).

The business structure of the agglomeration is very diverse and dominated by the business units of large, international ICT companies, such as Nokia, Elisa Communications, TietoEnator, Sonera, and Fujitsu Invia. For example, Nokia Corporation employs approximately 3,700 people almost purely in R&D activities in Tampere. The agglomeration is oriented towards research and development, which concerns also the above-mentioned business units of large companies. On the one hand, this orientation is favourable, because R&D is a more stable business function than sales, marketing and production, for example. On the other hand, it would be beneficial to the development of the agglomeration if Tampere also had more 'headquarter functions' with close connections to international markets, investors, etc. It can be claimed that the remarkable role of large companies in the agglomeration has negative side effects as well. The agglomeration has one major weakness, namely a debilitated entrepreneurial atmosphere, which is in turn linked to the paucity of (new) companies aiming at fast growth and internationalisation (cf. Autere 2000). Naturally, there are many small companies competing among themselves and also some advanced growth companies, but they are few in number, especially regarding the strong science and technology base of the agglomeration.

The rapid development of the agglomeration results partly from the natural, rapid development of the whole digital media sector. On the other hand, digital media has been one of the most important focus areas of local (business) development and innovation policy in Tampere Region. Therefore, several visionary and resolute local collective actions have been taken by both private and public actors – often together – towards

facilitating and strengthening the agglomeration and especially its institutional setting and knowledge base.

In the following chapters, some institutional features of the agglomeration and policy activities related to it are considered in greater detail. Attention is paid especially to the educational and research institutions and to the role of local specialised development organisations.

Educational and research institutions³

The strong science and technology base and the educational institutions are among the major strengths of the digital media agglomeration in Tampere. The most important institutions in this respect are the Tampere University of Technology, the University of Tampere, Tampere Polytechnic, and VTT Technical Research Centre of Finland.

Tampere University of Technology (TUT) has a central role in the digital media agglomeration. It has traditionally had very close relationships with local commercial and especially industrial activities, as well as with other institutions financing technological research. It is therefore natural that external funding is very crucial for TUT. In year 2003, 41.0 per cent of TUT's budget consists of external funding, mainly from The National Technology Agency of Finland (Tekes) (13.3%) and companies (12.2%). TUT and local companies collaborate in educational and research activities alike. Additionally, new forms of collaboration have been developed: part-time professorships for experts and managers working in companies are examples of these.

When considering TUT's collaboration with companies, the role of Nokia Corporation cannot be ignored. Many departments and institutes of the Tampere University of Technology have close linkages with diverse units of Nokia. Typical forms of collaboration have been commissioning and joint research projects, providing positions for trainees as well

as for undergraduates writing their theses, collaboration in the planning of basic, post-graduate and supplementary education, consultancy, inter-organisational job rotation, joint seminars, etc. These forms of collaboration are not recently developed; they have existed for several years (see e.g. Haavisto 1996). The collaboration between Nokia and educational and research institutions, especially TUT, is of great importance in relation to the development of the whole agglomeration: this good state of collaboration is one reason for Nokia's strategy to locate a considerable number of its R&D activities in Tampere.

ICT-related education and research began to strengthen in the 1980s when computer science became a major subject in TUT. Since then, the volumes in information, communication and electro-technical education and research have grown very rapidly. For example, the number of degrees completed at the Department of Information Technology per year has roughly been decupled since the year 1990. Especially in the mid-1990s there was a dramatic increase. In addition to diverse basic-degree and post-graduate education, TUT also offers in-service training and supplementary education. The Centre for Continuing Education (Edutech) is in this sense a central organisation, although institutes also arrange these courses by themselves. For example, the 'project manager course' has been arranged by the Institute of Software Systems for ten years now and approximately 400 experts from companies and other organisations have attended it. Thus it has been an interesting forum for local networking in addition to its educational substance.

A major part of digital-media-related research work in TUT is carried out in the Digital Media Institute (DMI). Another very important unit in this respect is the Optoelectronics Research Centre (ORC). DMI is a matrix organisation consisting of the following institutes of TUT: Institute of Signal Processing, Institute of Digital and Computer Systems, Institute of Software

Systems, Institute of Communications Engineering, Hypermedia Laboratory, Medical Information Technology in Seinäjoki, Information Technology in Pori and Institute of Electronics. Thus the research of the above-mentioned institutes is carried out under DMI, but teaching is conducted traditionally. This kind of organisational solution brings together research and education, on the one hand, and critical mass and better public visibility and accessibility of research on the other. DMI employs more than 400 researchers and research assistants. It coordinates Technology Engine Programmes, which constitute a subprogramme of the eTampere Programme.⁴ The aim of these programmes is to strengthen the ICT-related research in Tampere and to produce new, commercialiseable knowledge in various projects. DMI's total budget in 2003 was 14.9 million euros and it operates almost totally on external public and private funding. The National Technology Agency of Finland (Tekes) and the Academy of Finland are the main sources of funding and about one third of the funding is provided by private companies.

The Optoelectronics Research Centre interestingly illustrates the roles that a university institute can have in an agglomeration. Optoelectronics is an upward scientific sector, which also has vast commercial potential. ORC is an auxiliary institute operating under the Council of TUT and it has grown considerably during the few past years employing at the moment about 60 employees. The annual budget is some three million euros of which some three quarters consists of external funding. For instance, the City of Tampere finances ORC directly and the financial instruments of the EU are also used (ERDF, Objective 2). These investments in optoelectronics research are very well justifiable from the point of view of the local economic development policy: ORC aims explicitly to promote collaboration with companies and university spin-offs. It is also internationally oriented with research partners, both companies and university units, worldwide. Consequently,

ORC and its precursors have generated some succeeding spin-offs (e.g. Coherent-Tutcore) and attracted foreign investments in Tampere (e.g. Memscap S.A.).

The University of Tampere (UTA) has its roots in social sciences, but today it is a diversified university with approximately 12,500 first-degree students and 1,900 post-graduate students. Despite its emphasis on social sciences, UTA has long traditions in computer science and other digital-media-related fields of education and research. UTA started teaching activities in computer science in 1965, first ever in Nordic countries. Earlier the ICT and digital-media-related activities (e.g. computer science, information science, hypermedia) were dispersed in several faculties, but these were brought together under a new faculty, the Faculty of Information Sciences, in 2001. The reshaping of the faculty structure increases natural possibilities for synergetic action between different disciplines and makes them more 'visible' from the point of view of business life.

The Faculty of Information Sciences is an important unit in the agglomeration in terms of education and research. For example, there are about 90 employees in the Department of Computer and Information Sciences. Human-computer interaction is a very important area of research and there is even a separate Tampere Unit for Computer-Human Interaction (TAUCHI) and Usability Laboratory in the department for this purpose. The Usability Laboratory offers usability testing and evaluation services and training and consultancy related to usability matters. At the Department of Information Studies, for example, themes like information retrieval, seeking and management are researched. In addition to basic research activities, the department also offers research services in its main fields of competence.

The Hypermedia Laboratory also belongs to the Faculty of Information Sciences and it has grown significantly in the past

few years, employing currently about 50 experts. The Hypermedia Laboratory realises its research and development projects mainly in close collaboration with companies and other institutions. The main research themes of the laboratory are related to adaptive systems and contents, experience design, knowledge-creating systems (e.g. knowledge management tools) and learning (e.g. mobile learning and edutainment). Digital games and gaming is a rising field of research and teaching within the Hypermedia Laboratory. It has even established a Game Research Lab that focuses especially on game research from different viewpoints ranging from basic research to game concept development. The Hypermedia Laboratory is an important actor within Neogames, a locally rooted but national programme aiming to develop the Finnish digital game cluster (Kolehmainen 2004).

The second corner stone of digital-media-related activities at UTA is communication(s) theory and mass media. It has always been a very strong area in teaching and research within the university and in the past few years, the issues of new media (e.g. audiovisual media culture and education) have aroused great interest. Many researchers within social sciences and humanities have also become interested in issues related to digital media. From this perspective, the Information Society Institute (ISI) is a central organisation. ISI is a subprogramme of the eTampere programme and its main task is to promote research on the information society at UTA and TUT. ISI has been founded by UTA and TUT together, even though UTA bears the operational responsibility. Like ISI, the e-Business Research Center (eBRC) is a subprogramme of the eTampere programme and a joint venture of UTA and TUT. The aim of eBRC is to study different kinds of phenomena related to the electronic business activities in co-operation with the businesses themselves.

The Tampere Polytechnic completes the operations of the two universities in Tampere. It has a total of 17 training programmes

in the fields of engineering and transportation, business, culture and natural resources (forestry). Its diversified teaching activities support in many ways the development of a digital media agglomeration, although it is smaller than the two universities. Tampere Polytechnic has about 5,000 students and 400 teachers as well as three independent schools: the Business School, the School of Technology and Forestry, and the School of Art and Media. All of these schools carry out activities that are somehow connected with digital media. The School of Technology and Forestry produces engineers in the field of ICT and the Business School bachelors of business administration majoring in data processing (e.g. hypermedia and software business). Tampere Polytechnic also has a Teacher Education Center. The School of Art and Media was established in 1991; in 1996 it was affiliated to Tampere Polytechnic. The School of Art and Media has a very unique profile which combines art and communications, as well as the use of 'old' and 'new' technologies. It also has strong collaboration relationships to (local) media businesses: working life contacts are a crucial part of its education.

From the viewpoint of research, the units of *VTT Technical Research Centre of Finland* located in Tampere are important institutions in the digital media agglomeration. VTT provides technology and applied research services for private companies and other organisations. VTT Information Technology has made efforts to develop local collaboration, and a large number of its projects are conducted with local or regional partners. Its main customers are mobile phone manufacturers, teleoperators and small software companies. VTT Industrial Systems also has ICT-related activities in Tampere. For example, wireless data transmission technologies (e.g. WLAN), location technologies are researched. This unit is also responsible for the Research & Evaluation Laboratory (RELab), which is one of the subprogrammes of the eTampere programme.

The key research and educational institutions of the digital media agglomeration in Tampere and their major competence fields are summarised in Table 1.

Table 1. The key research and educational institutions of the digital media agglomeration in Tampere and their major competence fields

Organisation	Examples of competence fields
Tampere University of Technology <ul style="list-style-type: none"> • basic and applied research • education • commercial services 	<ul style="list-style-type: none"> • Digital and computer systems • Electronics • Software systems • Optoelectronics • Signal processing • Communications engineering • Virtual reality • Research on e-business
University of Tampere <ul style="list-style-type: none"> • basic and applied research • education • commercial services 	<ul style="list-style-type: none"> • Computer science (e.g. human–computer interaction) • Information studies (e.g. information retrieval and management) • Hypermedia • Journalism and mass communication • Research on information society and e-business
Tampere Polytechnic <ul style="list-style-type: none"> • education • development projects • commercial services 	<ul style="list-style-type: none"> • Data-processing (e.g. hypermedia and software business) • Computer and software technology • Communications (e.g. interacting media)
VTT Technical Research Centre of Finland (units located in Tampere) <ul style="list-style-type: none"> • basic and applied research • commercial services 	<ul style="list-style-type: none"> • Human interaction technologies and human-centred design • Wireless solutions • Integrated systems • Wellness Applications

Key special development organisations of the digital media agglomeration⁵

As mentioned earlier, digital media has been one of the key areas of local business development and innovation policy in Tampere. One of the main aims of policy actions has been to build a specialised business and innovation support organisation infrastructure. In this chapter, the key organisations in this respect are introduced. Although the basic technological knowledge and other competences of the agglomeration lie in companies, universities, research institutes and educational institutions, competent business support, development and intermediation organisation can harness these competences to better use and even participate in the process of creating new regional competences. When considering a certain agglomeration, the role of a specialised development organisation is emphasised, although a general development organisation (e.g. Employment and Economic Development Centres, the Business Development Centres of cities) can play an important role as an incidental opinion leader, financier, or strategist. However, this part covers only the most important specialised development organisations of the digital media agglomeration in Tampere: Tampere Science Park Ltd, Technology Centre Hermia Ltd, Hermia Business Development Ltd, Media Tampere Ltd, and Professia Ltd.

Tampere Science Parks Ltd was established in 2004 by merging all the business real estate businesses of City of Tampere. First, the business activities of Tampere Technology Centre Ltd were divided between two companies. Technology Centre Hermia Ltd carries out project and development activities and Hermia Premise Service Ltd took care of real estate business activities related to Hermia Science Park until it was merged with Finn-Medi Invest Ltd and Tampere Industrial Real Estate Ltd. These mergers resulted in the birth of Tampere Science Parks Ltd, which

is now responsible for the city council's real estate business related to its economic and business development policy.

As mentioned earlier, Technology Centre Hermia Ltd was established in 2004 and it takes care of its successor's – Tampere Technology Centre Ltd's – project and development activities. Tampere Technology Centre Ltd was established in 1990 and, in the beginning, its main aim was to develop the Technology Centre Hermia, which had been founded four years earlier. Later on, the tasks of promoting the development of high-tech companies and implementing the Regional Centre of Expertise Programme⁶ also became significant. The first of the above-mentioned tasks includes producing, commercialising and developing services (e.g. licensing and business plan evaluation) for existing high-tech companies and beginning companies alike. Currently, this very task is carried out by Hermia Business Development Ltd, which is now, after recent ownership arrangements, a privately-publicly owned business development company. This kind of private-public partnership is a relatively new phenomenon in regional development policy. Hermia Business Development Ltd is also responsible for the operations of the eAccelerator, which is a subprogramme of the eTampere programme (see also Jungman & Rasila 2005). The aim of the eAccelerator concept is to launch 20 companies onto a very rapid growth track by coaching the chosen companies, matching them with suitable partners (e.g. financiers, customers, suppliers) and offering pre-seed finance. Partly due to the changes in external business environment, the eAccelerator has altered its focus, strategy and activities. For example, the eAccelerator is now concentrating on more mature businesses that are still growth oriented.

The second task, namely the implementation of the Regional Centre of Expertise Programme, is carried out by the Technology Centre Hermia Ltd. There are four official Centres of Expertise in Tampere, and Tampere Technology Centre is responsible

for two of them (mechanical engineering and automation and information and communication technology). In practice this responsibility includes building co-operation networks and co-ordinating different kinds of education, research and technology initiatives, projects and programmes which are generated on the basis of companies' needs. The Tampere Region Centre of Expertise Programme does not have a very large financial base, but it is still an important forum for local collaboration. It also enhances and builds up the image of the region's expertise and competences.

Technology Centre Hermia Ltd is focusing on ICT strongly and cumulating specialised expertise in that area. Neogames is a good example of this path of development. Neogames is quite an ambitious national development project aiming to facilitate the growth and internationalisation of the Finnish digital game industry and its co-ordination unit is organisationally located in Technology Centre Hermia Ltd. The digital game industry is a very difficult business environment because of its many distinctive and special features and dynamics. The activities and services of Neogames have to be adjusted to those characteristics (Kolehmainen 2004).

The main activities of Neogames community are: 1) *the creation of a comprehensive network of players in the games field*, 2) *the development of games-related business*, 3) *the support and co-ordination of research related to and supporting the games field*, and 4) *the improvement of the image of the games field and making the field better known*. Although the core activities are pronounced quite clearly, the concrete ways in which they are conducted are still partly under development and they will be kept flexible. In practise, the networking task of Neogames means arranging different seminars and establishing special interest groups, just to name a few. The business development activity of Neogames crystallises itself in services that are provided for the member

organisations. These services include business consultancy (e.g. financing and legal matters) and other support for the development of future entertainment applications and games (e.g. technology and concept design, testing). These services are produced partly by the co-ordination unit and partly by the external partners. Neogames provides also market information to the members and acts as an intermediary of marketing channels (Kolehmainen 2004).

As was shown, Technology Centre Hermia Ltd and Hermia Business Development Ltd attend to the development of high-tech companies, including ICT companies (e.g. software companies and component manufacturers). In addition to those organisations, Tamlink Ltd is also closely linked to the Hermia Science Park and the 'technological side' of digital media. Tamlink is a technology transfer organisation and it was established already in 1986. It is owned by SITRA (Finnish National Fund for Research and Development), the Tampere University of Technology, the City of Tampere and Finnvera Plc. Tamlink Ltd has many kinds of services, but it focuses especially on the design and implementation of RTD projects. Information and communication technology is one, but only one, of its fields of expertise. All these above-mentioned specialised development organisations have very close and multi-faceted contacts with the Tampere University of Technology (TUT) and the interaction between them is facilitated by the spatial proximity: TUT's campus and Hermia Science Park form together a considerable concentration of R&D and other innovation-related activities, just as the theoretical ideas concerning science parks imply.

The other major part of the digital media branch consists of companies whose competencies are related to digital contents, communication (e.g. web services) and other knowledge-intensive services that are linked to digital media (e.g. web-based marketing). Media Tampere Ltd is specialised in developing

digital media companies of this kind in Tampere.⁷ Media Tampere Ltd is owned by Alma Media, Fujitsu Invia, Nokia Corporation, the City of Tampere, Elisa Plc and the University of Tampere Foundation. In practice, the development of digital media locally means establishing different kinds of development projects and facilitating co-operation between companies, educational and research institutions, financiers and other relevant organisations. These general networking and developing tasks are very much manifested in the implementation of the Centre of Expertise for Media Services, for which Media Tampere Ltd is responsible. Media Tampere Ltd also has its own R&D projects which are linked mainly to (public) web and mobile services.

Professia Ltd is a 'newcomer' in the support organisation infrastructure in Tampere. It was founded in 2000 and its focus lies in developing knowledge-intensive business service (KIBS) companies. Professia is owned equally by the City of Tampere, Tampere University Foundation, Finnvera Plc and Tampere Region Growth Foundation. Professia Ltd provides various kinds of consultancy services to beginning and already established KIBS companies, on the one hand, and to researchers and other personnel in universities and other institutions of higher education in Tampere on the other. This second task aims at advancing knowledge transfer from universities to companies and other organisations and the commercialisation of knowledge and expertise produced in research activities. In this respect, the focus is especially on the University of Tampere. Professia also offers typical incubation services for new companies within its thematic focus and currently it also runs Media Club Incubator, which was earlier more closely linked to Media Tampere Ltd. In addition to these more specific services, Professia Ltd bears the responsibility for the co-ordination of the Centre of Expertise for Knowledge-Intensive Business Services, which does not have the national Centre of Excellence status or the related financing from

the Ministry of the Interior. Instead, the centre is financed locally, as the development of the KIBS branch has been considered important. The key specialised development organisations of the digital media agglomeration in Tampere and their major functions and services are summarised in Table 2.

Table 2. The key specialised development organisations and some examples of their functions and services

Organisation	Examples of functions and services
Tampere Science Parks Ltd	<ul style="list-style-type: none"> • Provision of premises (e.g. Hermia Science Park, Finn-Medi)
Technology Centre Hermia Ltd	<ul style="list-style-type: none"> • Co-ordination of Centre of Expertise (Information and Communication Technology) • Development projects and programmes (e.g. NeoGames, COSS)
Hermia Business Development Ltd	<ul style="list-style-type: none"> • Commercialisation of product and business ideas • Development of technology-based companies • Incubator • eAccelerator (a part of eTampere programme)
Tamlink Ltd	<ul style="list-style-type: none"> • planning of research and technology • development, implementation and management of (RTD) projects • co-ordination of EU and other consortium projects • technology evaluations and analyses and feasibility studies • business surveys and analyses
Media Tampere Ltd	<ul style="list-style-type: none"> • Product development (web services) • Consultancy and project management • Development of media and new media firms • Incubator (Media Club) • Co-ordination of Centre of Expertise (Media Services)
Professia Ltd	<ul style="list-style-type: none"> • Development of KIBS companies • Incubator (Media Club) • Co-ordination of Centre of Expertise (Expert Services)

Discussion and concluding remarks

First, economic activities seem to have a tendency to cluster in certain regions or localities because of different kinds of agglomeration economies. Consequently, the territorial agglomerations and their (internal) dynamics have aroused interest among researchers for a long time. Second, the great economic importance of innovations and learning has been recognised widely. Companies are naturally in primary roles in innovation processes that are very often recursive and interactive in nature, which accentuates the role of companies' customers, suppliers, subcontractors, partner companies, financiers, research institutes, semi-public and public development organisations, etc. Therefore, both explicit, inter-organisational innovation networks and weaker innovation-related social linkages have gained more strategic importance. The localisation of these innovation networks and social linkages augment the positive effect of 'pure' agglomeration economies, thus facilitating the flows of knowledge and innovation. However, these notions together invite us to further elaborate on the role of territorial agglomerations in boosting the local innovation performance.

It is often – though axiomatically – claimed that agglomerations boost the companies' innovation activities. It would be more accurate to state that a territorial agglomeration can be a basis for the development of a good local innovation environment. Consequently the agglomeration does not automatically and directly enhance the innovation activities of companies within it. The agglomeration and local innovation environment formed on it may make no difference at all, or they may even inhibit innovation. The ways in which local operational environment can promote innovation are very complex and intricate. It was argued that a local innovation environment consists of many interrelated elements ranging from the

institutional setting to the behaviour of individuals. It was also argued that the local innovation environment can be divided into three levels: 1. *the structural and institutional level*, 2. *the level of organisational relationships* and 3. *the level of individuals*. There are certain characteristics in each of these levels that are necessary for the local innovation environment to really set the scene for the innovation activities companies.

In this article, the role of the institutional setting of the local innovation environment was discussed more in detail. The focus was particularly on the knowledge institutions. On the one hand, the role of the educational and research institutions within a local innovation environment was dealt with. On the other hand, the different activities of so-called specialised development organisations were examined. The case of a digital media agglomeration in Tampere was used as an empirical illustration for the theoretical themes debated in article. The roots of the agglomeration go quite far back in history, but it grew very rapidly and reached its current form only in the 1990s. In conclusion, the case of digital media agglomeration in Tampere accentuates the importance of the institutional setting of the agglomeration and public policy measures.

It was noticed that educational and research institutions, universities in particular, have many roles within the local innovation environment. Primarily, on the very structural level, they are producers of human and especially intellectual resources by their basic tasks, namely research and education. In terms of direct links with the business world, the educational and research institutions do not only collaborate with local companies, but they can also generate and attract new businesses to the region. Still, these three tasks do not describe the role of educational and research institutions within a local innovation environment exhaustively. For example, these organisations usually have international linkages that channel new information

and knowledge to the local innovation environment. They are also important from the individuals' point of view: they are an important part of the 'creative problem-solving environment' mentioned earlier.

From the empirical point of view, it can be claimed that universities and other educational and research institutions have played a crucial role in the digital media agglomeration and also constitute one of its major strengths. For example, the versatile set of educational institutions has guaranteed the availability of skilled applicants for the companies during the stage of rapid growth of the digital media sector as a whole as well. In addition to the high volume of education, the diversity of educational activities seems to be an important feature of the digital media agglomeration in Tampere. The Tampere University of Technology, University of Tampere and Tampere Polytechnic augment each others' activities efficiently. Also with respect to research, the diversity of the agglomeration is notable and it has contributed to the development of the agglomeration. Many of the units of the universities and the polytechnic are quite advanced in their activities and practises with the (local) business world.

The specialised development organisations provide services that facilitate innovation within individual companies. However, these organisations have characteristically also broader assignments, such as networking different actors (e.g. universities and companies) together for different purposes. These activities can be named as boundary-spanning activities, because the term boundary-spanning describes quite well the challenge of acting as an intermediary between and among organisations with varying motives, interests, financial and knowledge resources, capabilities and practises, just to name a few differences. Furthermore, the institutions mentioned above can be seen as linking organisations also in broader sense. For example, the

cluster development activities are usually of that nature. Namely, cluster development is usually about creating open forums and circumstances for emergence of collective innovation processes and other collaborative activities, to mention a few examples. At the same time the common view of the cluster and its actors is built and strengthened to facilitate these processes and activities. Cluster development involves usually the building of external relationships and acts of external marketing.

The special development organisations also play a key role in capitalising on the economic potential of local educational and research institutions which is based on the knowledge they produce. That is one of the key arguments in this article. In this respect, the division between knowledge generation and exploitation systems within regional systems was highlighted. It was also emphasised that there are institutions – specialised development organisations – that tie these subsystems together. It is not always understood that this linking, or boundary-spanning, task is quite demanding, especially because of information and knowledge requirements related to it. This holds true also in the case of the high-technology and knowledge-intensive branches, which are usually very challenging business environments due to the rapid development and technological, financial, legal challenges and risks, for example. The specialised development organisation meets these challenges also when delivering support services to individual companies or interacting with them otherwise. Consequently, the requirements towards these development organisations are increasing. In addition to the branch-specific knowledge, the specialised development organisation needs also more general skills. The different fields of that expertise can be described as follows:

- *Technological and business expertise.* The specialised development organisations have direct contacts with customer companies and they offer many kinds of internal

support services. The customer companies have usually some kind of problem or challenge and they need assistance to solve the situation. These problems and challenges may be related to technology, finance, legal matters, production, organisation, human resources, networking and partnering, etc. The specialised development organisation is expected to have expertise on all these issues and the customer companies' expectations are usually very high. From the perspective of the development organisation the situation is very demanding: it should be able to consult the customer company in a very specific way and still to deliver services to a large number of companies. Furthermore, the consultancy service product range of the specialised development organisations is usually quite wide ranging from basic incubation services to very complicated technological and legal issues. Even this field of expertise is very broad and demanding.

- *Expertise in network management, boundary spanning and development processes.* Specialised development organisations 'weave' nets among companies and other organisations. These tasks require skills and competences in network management and management of development processes. Increasing attention should be paid to these competences and skills because well-functioning networks can be of high value in respect of actors belonging to them and in respect of regional development more generally (cf. Linnamaa 2004).
- *Institutional expertise and expertise in regional development.* The specialised development organisations are usually operative organisations that implement in practise broader definitions of regional or local economic development and innovation policy. However, these organisations also take

part in the formulation of the definition of these policies. To be able to contribute to these processes, the specialised development organisations need to have competencies in regional development. This requires a broad picture of the whole development system, or, in other words, the regional innovation system or the institutional setting of local innovation environment. These organisations should also be deeply aware of the international, national and regional policy processes, development programmes, policy initiatives, etc. Regional development work is not only policy, but politics is also involved and understanding concerning its dynamics is necessary at least to some extent.

Due to the challenging nature of the specialised development activities, these organisations should be of high quality. In this respect, especially two issues are of great importance. First, it should be noted that the work done by the specialised development organisations is 'craftsmanlike' and highly dependent on the key people who are actually taking care of the customer companies and development projects. Consequently, the competences and skills of the development organisations are high embodied in employees. That notion highlights the importance of the recruitment and personnel development within these development organisations. Until recently, too little attention has been paid to these crucial issues.

Second, it can be argued that the specialised development organisations should be even more specialised and more focused to meet the needs of customer organisations better. The precondition for this kind of development is in many cases the broadening of their market focus in geographical terms to ensure a sufficient number of potential customers. This requirement leads to the national or even international focus. This notion

includes also the idea that the development work could be ‘real business’. However, all the functions, activities and services of the specialised development organisations cannot be delivered totally on the market basis, but public financial support is needed. Business incubation services are typically of that nature. The precondition for the implementation of the more focused strategy and becoming business that could even export services outside the region is the enhancement of the competences in a very broad sense.

Development of competences refers here to the upgrading of all the activities of these organisations. It refers to the development of personnel’s skills, enhancement of internal processes (e.g. knowledge management), broadening of networks (e.g. making new contacts with organisations of ‘good quality’), consolidation of the economic basis (e.g. free assets that allows internal R&D and taking some financial risks). These are very challenging tasks, especially taking into account that the internal development of the specialised development organisation is usually gradual in nature due to many factors, such as scarce financial resources. In sum, all these notions of the challenges of the specialised development organisations call for capable and innovative management. To make the situation even more demanding, it has to be noted that these managers are not responsible only for their own organisations, but they may have more far-reaching role as leaders of the whole local or regional innovation environment. This role is not official or formal, but they use their influence, knowledge, networks and other personal assets when different kinds of regional strategies are formulated and implemented and initiatives are planned and launched. Managing innovation environments requires shared leadership and influencing the development through reshaping (institutional) structures, making new interpretations, activating ‘energy’ and developing the competences (Stähle et al. 2004; Smedlund et al. 2005). The

competence development refers here to the regional competences that to some extent different from the organisational competences (see Sotarauta 2000).

The innovation support infrastructure, and especially the set of specialised development organisations, seems to be quite extensive and solid in the digital media agglomeration in Tampere. The empirical case also implies that several local collective actions have been taken by both private and public actors, often together, towards facilitating and strengthening the knowledge institutions that can be benefited by a number of companies. These actions indicate that many companies, or at least certain decision makers in those companies, have acknowledged the possibilities to intentionally build their local environment to match their needs of complementary and untraded assets. It should also be noted that the role of the City of Tampere and other public actors has also been crucial in the creation of the institutional setting of the agglomeration. Furthermore, the recent modifications of the institutional setting suggest that the policy makers are constantly developing it. There are also some pointers that some of the specialised development organisations are taking bold steps in developing their own services and businesses in line with the future directions that were suggested in this section. In any case, the aims seem to be high and means to attain these aims can be trailblazing.

Although the importance of knowledge institutions was stressed in this article, it is worth reminding that certain structures, institutional settings or policy activities alone cannot guarantee the innovativeness and innovation performance of a territorial agglomeration. For example, the actual role of knowledge institutions in the development of digital media agglomeration in Tampere is very difficult to evaluate. It is sure that especially the universities and other educational and research organisations have contributed to the development

considerably through their basic activities. On the other hand, the specialised development organisations have created forums for collaboration among companies and other organisations (e.g. Centre of Expertise Programme) and made the agglomeration visible to the companies belonging to it and to the rest of the world. In any case, it is good to bear in mind that the success of an agglomeration in terms of innovation results always from the innovativeness and innovation performance of companies and individuals belonging to the agglomeration. This holds true also in digital media agglomeration in Tampere. Still, knowledge institutions as a part of the local innovation environment can and should support the development of these companies and individuals. That is what they are for.

However, it is important to notice that gaining success and maintaining sustainable competitiveness in the 'global innovation competition' are becoming harder and harder due to the increasing internationalisation of the R&D and other activities. For example, there are several rapidly growing ICT agglomerations in China and India which are challenging the existing agglomerations holding the leading or prominent positions within the field of ICT. According to some quite recent interrelated foresight studies, the development of digital media agglomeration in Tampere seems to be fairly favourable, at least in the short and medium run (see Mäkinen et al. 2004; Sneek et al. 2004; Kautonen et al. 2004). There are many growth sectors and new opportunities within the field of digital media as is defined in this article (e.g. digital gaming, digital communication in health care, data security and other digital and electronic services). On the other hand, the challenges of internationalisation and increasing international competition were also recognised as well as the technological risks.

It can be argued that the increasing international competition has implications also for knowledge institutions.

The emerging growth areas have different competitive advantages in comparison with the existing successful agglomerations. The high-skilled labour force is there cheaper than in traditional ICT agglomerations and they are also catching up rapidly those agglomerations in terms of technological progressiveness and innovativeness. It can be argued that the knowledge institutions play a key role in this 'innovation competition'. Accordingly, the challenges of knowledge institutions are growing also in this respect. The knowledge institutions can enhance the competitiveness of the agglomeration only by being internationally competitive by themselves. That is possible only by developing competences and activities persistently and focusedly. This notion concerns research and educational organisations and development organisations alike. It can be seen as a huge challenge and an opportunity at the same time also for the knowledge institutions of the digital media agglomeration in Tampere.

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Media Tampere Ltd	www.mediatampere.fi
Hermia Business Development Ltd	www.yrke.hermia.fi
Professia Ltd	www.professia.fi
Tampere Polytechnic	www.tpu.fi
Tampere Science Parks Ltd.	www.hermia.fi
Tampere University of Technology	www.tut.fi
Technology Centre Hermia Ltd.	www.hermia.fi
University of Tampere	www.uta.fi
VTT Technical Research Centre of Finland	www.vtt.fi

Endnotes

- ¹ The VIA project was conducted at Work Research Centre, University of Tampere, and funded by the National Technology Agency of Finland (Tekes) (see the final report by Kautonen et al. 2002). The project was a part of the Technology Study Programme of Tekes and the Finnish Ministry of Trade and Industry. The basic description of a digital media agglomeration in Tampere and its innovation support infrastructure is mainly based on this VIA project. The main data consisted of 29 interviews of experts working in digital media related companies (11) and other organisations (18)

alike. Interviews were conducted in the years 2000 and 2001. In addition to interview data, a considerable amount of other written and electronic materials (e.g. statistics, bulletins, articles, websites) have been used.

- ² The digital media agglomeration in Tampere includes those actors that 1) produce digital or digitality-related products and service; 2) produce products and services whose production process is based on digital technology; 3) produce and disseminate digitality-based technology, knowledge and competencies (e.g. educational and research institutes); and/or 4) in some other way promote digitality-related business, entrepreneurship, research, educational or civic activities and that are located within the Tampere city-region. In other words, the digital media is in this paper understood in its broadest sense and the concept of ICT cluster could have been used almost equivalently. However, the concept of digital media accentuates the role of digitalising content production in addition to the production of products based on digital technology.
- ³ Updated details have been checked on the websites of organisations in question. The list of the relevant websites can be found below the bibliography.
- ⁴ eTampere Programme is a five-year development project with a total budget of 130 million euro and it aims to provide an extensive and possibly the first local application for the EU-based eEurope Programme. The general objective of eTampere is to make Tampere a global leader in the research, development and application of issues related to the information society. To achieve this very bold goal, the programme focuses on three themes: 1) public online services will be developed and made available to all residents, 2) the knowledge base of research and training will be strengthened and 3) new business related to the information society will be generated. There are seven subprogrammes in this programme (co-ordinator / background organisation in parenthesis): 1. *Information Society Institute (UTA)*, 2. *eBusiness Research Center (TUT & UTA)*, 3. *Research and Evaluation Laboratory RELab (VTT)*, 4. *the eAccelerator (Hermia Business Development Ltd.)*, 5. *Technology Engine Programmes (TUT / DMI)*, 6. *Infocity (City of Tampere)*, and 7. *eTampere Office (Media Tampere Ltd.)*
- ⁵ Updated details have been checked on the websites of organisations in question. The list of the relevant websites can be found below the bibliography.

- ⁶ The Tampere Region Centre of Expertise Programme is a part of the national Centre of Expertise Programme co-ordinated by the Ministry of the Interior. The basic idea of this programme is to enhance the collaboration among companies and between companies and research and educational institutions in order to stimulate and develop high-profile business activities. Tampere has four officially and nationally recognised Centres of Expertise: Mechanical Engineering and Automation, Information and Communication Technology, Health Care Technology and Media Services. Besides the seed finance by the ministry, the programme is financed by National Technology Agency of Finland TEKES, the Council of Tampere Region, the City of Tampere and nine of its neighbouring municipalities.
- ⁷ The Finnish Ministry of Education has contracted out an interesting mapping on the current situation of content production and Tampere was dealt with very visibly and positively in this report (see Pennanen 2002).