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FINNISH CITY REINVENTED
TAMPERE'S PATH FROM INDUSTRIAL TO KNOWLEDGE ECONOMY

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Juha Kostiainen & Markku Sotarauta

1 Introduction[1]

In 1960, there were approximately 33,000 industrial jobs in Tampere, which made up over 50% of all working places. That same year the first university students began their studies in Tampere. Correspondingly, in the year 2000, there were approximately 22,000 industrial jobs, which accounted for 21% of all working places in Tampere. The number of university students was about 25,000[2]. In the span of 40 years, Tampere has transformed from the leading town of industrialised Finland into one of the foremost Finnish cities of the knowledge economy.

The change is vast, but Tampere has been accustomed to continuous change throughout its history. First, it developed from a small village into Finland's leading industrial town. When traditional industry fell into crisis, Tampere once more had to recreate itself and has since risen to a position in which it is among the top cities on the cutting edge of utilising the possibilities of new knowledge-based technologies.

What happened in Tampere? What are the factors that influenced the change? Is the transformation of Tampere due to local, national or global courses of events? Moreover, what is the relationship between intentional development activities and the emergence of change? What factors of development could be influenced and how? Has the destiny of Tampere evolved in its own hands, or has the city been at the mercy of external forces?

An analysis of the relationship between global and local forces and resources provides a general point of departure in a search for answers to these questions. The relationship between global and local forces in regional and urban restructuration processes is indeed one of the themes that are of interest in studies focusing on regional and local economic development. In the 1970s, there was a tendency to understand regional and local development in quite a straightforward way as a consequence of more general societal processes (Häkli 1992, 43). This discourse was initiated along with claims that the forms of local development are more a result of global forces (multinational corporations, international capital and the international division of labour) than of local forces (Machimura 1998). In the 1980s, the "new regionalism" grew in importance in regional economic research as a counterbalance to the trend that stressed the impact of general societal forces (Lagendijk 1998). The new emphasis on the regional and local levels became apparent, for instance, in

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[2] Statistics Finland; www.tut.fi; www.uta.fi; the City of Tampere, result evaluation group.

the fact that development was increasingly seen to emerge from bottom up (e.g. Stöhr 1981 and 1988), as well as in the many models of local development in the 1990s and 2000s which, in one way or another, stress the significance of locality in economic development. Such models include innovative milieus (Camagni 1991, Camagni 1995, Maillat 1995), new industrial spaces (Storper 1995, Sternberg 1996), industrial districts (Harrison 1992), networked regions and learning regions (Morgan 1997, Asheim 1996, Oinas and Virkkala 1997) and regional innovation systems (Cooke et al. 1996, Cooke 1998).

On the basis of the models that emphasise local forces, many regions have attempted to promote local-oriented endogenous development. This places emphasis on geographic proximity and integration of local resources, actors and expertise, but as Cox (1988) has asked: is it ultimately possible to say that a certain place in and of itself is able to generate development without external influences or development impulses? Moreover, Amin and Tomaney (1995) note that the significance of a region is relative with regard to the accumulation of expertise and, at the same time, generation of economic development. They underline the significance of the nation state and remark that writers who emphasise only the innovation capacity of a given network, or a ”learning region”, may actually ignore the importance of national endeavours in developmental activities.

In Finland, the national viewpoint has traditionally been stressed in promotion of regional development, even though the position of local government is traditionally strong. In the 1990s, the role of regions and municipalities was further emphasised and, consequently, more decision-making power was transferred to regions and municipalities. The emphasis on national administration becomes apparent, for instance, in the fact that in the development of regional innovation systems, regional features are often left in a secondary position (Kostiainen & Sotarauta 2000) as the emphasis has first and foremost been placed on their link to the national system (Kautonen & Sotarauta 1999). The Finnish national innovation system has indeed been broadly studied and has developed into a framework that interlinks different policy sectors and directs many activities (see Hämäläinen and Schienstock 2001). In a small country like Finland it is nevertheless vital that both national and regional resolutions are interlinked to form one entity. Hence, from the viewpoint of local development, the core question is: what is the relationship between the internal and external processes of the region?

From these points of departure, the objective of this article is to recognise the internal and external forces that have had an impact on the development of Tampere, as well as the dynamics of the relationships between them. The objective is thus to identify those factors and forces that have laid the foundation for the economic change and the development of the new knowledge economy. We first frame the core concepts to use as tools to get an insight into Tampere’s course of development, and then, we describe and analyse the development of Tampere from a small village into the leading industrial town in Finland, and further, into one of the pre-eminent cities of the knowledge economy.

2 Framing Key Concepts

In the analysis of the course of development of Tampere, the point of departure is the societal and economic transformation towards knowledge economies. As Cooke (2002, 3) states, all economies are in a trivial sense "knowledge economies" being dependent on knowledge. In the early 2000's, however, advanced economies have entered, or to be more precise, are entering to what is often labeled knowledge economies, in which knowledge has more crucial role than before. In knowledge economies, economic clusters consist in knowledge acting upon knowledge itself for productivity (Cooke 2002, 190; see Castells 1996 too). There are three main issues, according to Cooke (2002, 3-4), specific to knowledge economies; a) knowledge ages rapidly and new knowledge is constantly replacing the old one, b) scientific (including social scientific) knowledge is highly valued, and the scale and economic penetration of scientific knowledge exceeds distinctly the previous economic development phases, and c) knowledge economies are especially characterized by explotation of new knowledge in order to create more new knowledge. New knowledge may also be artistic knowledge in all its variety.

According to Castells (1996, 66), the network society, as he calls the emerging development phase, is typically informational and global. He thus links the basic features of knowledge economies and globalization strongly together, and the paradoxical relationship between global and local emerges as an interesting issue in Tampere case too. The relationship between local and global is paradoxical in so far as the better something works on the global level, the more it must rely on the local environment which is characteristically immobile and specific (Cabus 2001, 1014). Swyngedouw (1992) describes the interlinking of local and global with the concept of glocalisation. In glocalisation, the significance of both the local and global levels increase, and they become interlinked to each other whereas the meaning of the national level is seen to decrease relatively. Castells describes this change with the notion that we have moved from space of places to the space of flows. He emphasises flows of capital, information and technologies as forces that mould global events. Moreover, he points out the flows of symbols and images, as well as flows that reflect interaction between organisations. He also remarks that dominant activities and processes increasingly organise themselves in networks. However, places do not cease to exist but their logics and meaning fuse into networks. Even though the logics of flows are independent of places, spaces of flows in themselves are not placeless. (Castells 1996.) Local elites are ready to act on the terms of global networks and flows, because they see it as the only means to develop the locality.

The network society changes the roles of places, such as cities, and positions them increasingly often as opposites in relation to both each other and flows. As Hall (1997, 316) notes, cities compete with one another even harder than before when they continuously attempt to redefine their economic role as past activities fade away. Cities are searching for their own positions as a part of flows, and strive to develop into significant nodes and hubs of

various flows. Local elites are ready to act on the terms of global networks and flows, because they see it as the only means to develop the locality.

If we take glocalisation and the space of flows thinking as starting points, the conceptual model in which only global and multinational events and trends affect development is obviously an over-simplification. This has been quite clearly proven by many studies. Thoughts about localities being able to construct their development from purely their own local points of departure seem to be a similarly oversimplification. Our point of departure in the analysis of the course of development of Tampere is that a dynamic relationship between the local, national and global levels is in the central position.

Additionally, it has been emphasised that as the competitive environment rapidly changes, the resources, or input, of developmental activities must be continuously renewed and increased. The role and nature of *resources* is also brought up. Hence the core question is: what have been the most important resources in each phase of development? In this paper, resources are understood as input, that is, things upon which it is possible to construct development.

Learning is brought up as one of the crucial issues of the development and birth of a successful region. Behind this idea we can detect the notion that a local environment decreases the uncertainty that companies face in the markets of the rapidly changing global environment, namely, the gap of competencies consequent to the companies' inability to acquire and interpret information. (Camagni 1991.) Learning is seen as the means of renewal and increase of resources (Oinas & Virkkala 1997; Asheim 1996). Morgan (1997) and Maskell (1996) specifically emphasise the significance of courses of action characteristic to the region in its development; in Maskell's terms, "regional culture".

Therefore, economic phenomena can be seen primarily as social processes and economic activities as embedded in the social community and its manifold interactive processes. (See e.g. Granovetter 1985, Maskell & Malmberg 1999, Storper 1995, Asheim 1996) Several studies also emphasise the significance of institutions in regional development (see e.g. Maskell 1996; Morgan 1997; North 1992). In this, attention is particularly paid to public and private organisations which support networking and the development of economic activities in the regions. Institutions are seen as a central source of the development of local economy. (Cooke & Morgan 1993.)

Institutions can generally be seen as a framework for actions and choices. Therefore, institutions refer to the relatively permanent modes of operation, rules and resources and the organisational field, which give the development actions and various networks their basic form. In contemporary regional economy research, special importance is attached to informal institutions and regularly recurring behaviour generated by culture – habits, customs and routines. Formal institutions are also significant for development activities: formal institutions come into being when it is judged necessary to create a new mode of operation, which is presented in the form of a law, statute or written contract, or is realised through

some specific organisation (see e.g. Maskell 1996; Klijn & Teisman 1997; Linnamaa 1999 and 2001.)

Amin and Thrift have emphasised the significance of *institutional thickness* in regional development. ”Institutionally thick” areas are rich in various institutions; namely, entrepreneurs, interest groups for enterprises, entrepreneur service organisations, trade unions, technology centres, finance organisations, educational institutes, state regional administrative authorities and so on, which all affect the development of the region through their own activities. However, merely a large number of institutions are not sufficient to create institutional thickness; the creation of cooperation-enabling structures and lively cooperation between organisational institutions is also required. (Amin & Thrift 1995.)

Institutional thickness can be considered to be one of the central factors in the emergence of the *path dependency* of development. The term path dependency denotes the significance of past development to current and future development (see e.g. Eskelinen & Kautonen 1996; Teece, Pisano & Schuen 1997). According to Michael Radzicki and John Sterman, path dependency is a feature of models that get locked into that one particular dynamic path they initially ’choose’ (usually by chance). When these models describe socio-economic processes, the choice is made by participants in the system rather than by natural forces. (Atkinson & Oleson 1996.)

Therefore, path dependency is another way of understanding economic change as a process of cumulative causation where the dominant feedback loops are self-reinforcing rather than self-correcting as in equilibrium models. Self-reinforcing feedback systems become evolutionary models because, if allowed to continue without some off-setting or opposing feedback, they will cause the underlying structure to change rather than re-establishing a new equilibrium within an unchanged structure as self-correcting systems do. Once the structure has changed, it is not possible to reverse the process and return to the previous equilibrium position because it has been eliminated as the structure has changed. An existing path may have been determined by an incidental event in the past, or by the cumulative effects of past actions, and this means that the path we are on may or may not be desirable; more likely it is desirable by some and not by others. (Atkinson & Oleson 1996.)

On the other hand, path dependency can mean an excessive locking into a previous path. In this case, creating new and realising necessary changes becomes increasingly difficult; either structural change occurs through a crisis or the region gets stuck into a slowly diminishing vicious circle. The core question then is how it is possible to disengage the region from bottlenecks and thus create the preconditions for the emergence of a new path.

In addition to the concepts of resource, path dependency and institution, this article analyses the development of Tampere through such concepts as actor and perception. These concepts are examined from the viewpoint of the course of Tampere’s development, and hence such concept as *critical incident* also rise to a central position.

Entities that are able to act are called *actors*. The key questions are who were the key actors in different phases of the development of Tampere, who has acted with whom, and

what is the relationship between key actors in critical incidents. *A critical incident* is a factor that significantly directs the course of future development. It opens up certain new future opportunities while excluding others. The core question here is: what are the critical incidents of Tampere in the different phases of development? *Perceptions* refer to the differences and similarities in the values, goals and perspectives of actors on a given issue. Including perceptions as a focal point in regional development is based on the fact that actors do not react directly to reality but rather to internally constructed perceptions of reality. (van der Hejden 1996.) Therefore, perception refers to the thinking patterns of individuals and groups, and thus the core questions are: what are the dominant perceptions in different phases of the development and how and why they have changed; what is the significance of perceptions in the course of events?

Answers are sought to the following questions:

- What have been the principal phases of the development of Tampere?
- What were the critical incidents at those times, and how can they be interpreted to have influenced later development? How did the past development affect the critical incidents in question?
- Who were the key actors both at the time and/or in a given individual critical incident? (This applies to both individuals and groups.) What factors and/or actor groups had a specific influence on the development, and what kinds of influence did they have?
- What new institutions were born and/or how did the institutions influence the course of development?
- What was the prevailing perception during the time and how did it affect different actors; in short, what was the spirit of times?

The phases of the development of Tampere have been recognised by analysing studies focusing on the history of Tampere (Rasila 1984, 1988 and 1992; Björklund 1993; Haapala 1986; Jutikkala 1979). In this article, the development of Tampere is grouped in the following way: 1) Founding of the town and the first steps of industry 1775-1820; 2) the birth of large-scale industry and the stabilisation of industry 1820-1920; 3) the expansion of industry and the beginning of recession 1920-1960; 4) the decline in heavy industry and the birth of the knowledge economy 1960-1990; and 5) the systematic institutionalisation of the knowledge economy (1990-).

3 Founding of the Town and the First Steps of Industry 1775-1820

The town of Tampere was founded on the 1st of October 1779, when King Gustav III of Sweden certified the charter of the town with his signature. Founding the town of Tampere was by no means a new idea, as merchants of Turku had suggested it as early as 1640.

All towns founded before Tampere in Finland were bound by the regulations of the legislation for towns, even though they did have their own internal autonomy and self-governmental rights. Tampere, however, was born a free town, where trade and industrial enterprising was unrestricted and in whose founding documents lists factories and craftsmen's establishments in addition to trade. Tampere was founded expressly as an

industrial town. At the time, of all of the towns of Sweden only Eskilstuna enjoyed a similar full autonomy of industries which promoted industrial activity (Seppälä 1998, 10). A new notion that also emerged was that agricultural activities of the townspeople, which was a common phenomenon in old towns, were completely forbidden. The new town was to be founded on the Tammerkoski rapids, precisely because the need for water plants specifically ordered it to be founded on the banks of the Tammerkoski rapids. When the King was deliberating the appropriate location of the new town, he realised the power production prospects of the rapids that cut through the isthmus between the two lakes Näsijärvi and Pyhäjärvi. (Rasila 1988, 379-398.) For some time, the town remained fairly small (figure 1): 15 years after its founding the population was approximately 400 people, but after that the town rapidly grew.

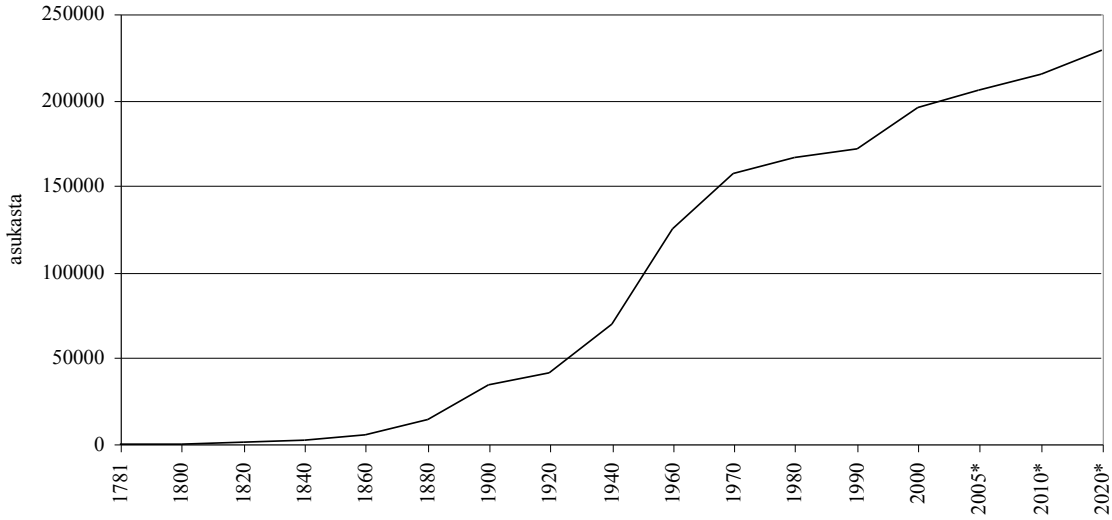

FIGURE 1. Population growth of Tampere 1781-2020* (2005-2020 Forecast by Statistics Finland)

Industrial activities were started rather soon after the town was founded, and a rag paper mill, dyeing house, brick factory, gun barrel factory and leather fulling house were established in the town at a relatively rapid pace. (Björklund 1993, 10; Seppälä 1998, 11.) At first, enterprises from other counties of Finland, as well as Stockholm, came to town. Already before the official founding of Tampere, a Crown distillery had been founded on the banks of the Tammerkoski rapids by order of the King in 1775 (Rasila 1988, 418).

In 1809, Finland was passed on from the Swedish monarchs to the rule of Russian tsars. Finland's position was greatly improved by the change and it became an autonomous grand duchy of Russia. The industrial development planned for Tampere by the King remained rather modest at the turn of the century (Björklund 1993, 10-11), but by giving Tampere the free town rights, King Gustav III nevertheless laid the foundation stone for the birth of Finnish industry.

The principal critical incident of this era was the actual founding of the town, but a few years earlier this was preceded by the ascension of King Gustav III to the throne, who represented a new way of thinking. The founding of the town well illustrates the renewal of perceptions characteristic to the time even in a more general sense. Along with the ascension of King Gustav III to power, the new way of thinking gained ground. Its most central notion was economic freedom; the freedom to practise a profession and ply a trade, as well as the freedom of ownership and to enter contracts: in a word, the freedom of enterprise. (Rasila 1988, 384-387.)

Along with the founding of the town various administrative institutions were created, but the one institution that had an essential impact on the nature of the town was freedom of trade which created the preconditions for the birth of industry. In addition to the King, a committee appointed to develop agriculture and a governmental council, which both proposed the founding of the town to the King (Rasila 1988, 379-391), were key actors in regard to the founding of the town. In the beginning of the development of Tampere, national decisions provided an opening to the new times. The rapids were the primary resource on which industry began to develop. The rapids and the new freedom were the drawing forces that attracted new actors: the enterprisers. The new enterprisers who came to exploit the power resources provided by the rapids as well as the new freedom took a central position in the creation of industrial Tampere.

4 The Birth of Large-Scale Industry and the Stabilisation of Industry 1820-1920

The Scotsman James Finlayson can be considered the real industrialist of Tampere. He had visited the town in 1819 and recognised its potential for initiating industrial activities. During the very same year, Finlayson submitted a petition to the tsar to implement his plans for industrialisation. Finlayson's plan included a foundry for manufacturing different types of machinery for the handling of cotton, wool and linen, a manufacturing workshop, a refinery for processing hemp, linen, wool and cotton, as well as "other useful factory and manufacturing plants". Finlayson applied for freedom from customs duty for the import of necessary materials, ownership of the Tammerkoski falls and help in purchasing pig iron and coal, as well as for other privileges. His petition was granted. In the beginning, Finlayson's areas of activity were machinery, the spinning and weaving of cotton, as well as industrial manufacturing of cotton thread. This marked the birth of large-scale industry both in Tampere and throughout Finland.

Starting up industrial activities was laborious, and Finlayson faced difficulties of many kinds. As his health was failing, Finlayson sold the factories to businessmen of German origin who had earlier operated in Russia. (Rasila 1988, 562-581.)

In 1842, Tampere shifted into the mechanical industry, when Finland's first paper machine was ordered from England for the rag paper mill in Tampere. In 1856, the manufacturing of inland water ships was begun in Tampere and, at approximately the same

time, a broadcloth factory was transferred to the town. Both the owners of the broadcloth factory and the inland water ship manufacturers were in debt and decided to combine their resources. This resulted in the founding of the Tampere Linen and Iron Industry Ltd. The company became known by the name Tampella and was one of the most important companies in Finland until the end of the 1980s. (Seppälä 1988, 13-15.)

By 1870, industrial activities in Tampere were significantly expanded and diversified. The most significant enterprisers and know-how came from abroad. Only gradually, inspired by the example of larger companies, did Tampere's own craftsmen take up private enterprising. However, many of these enterprises were short-lived. (Björklund 1993, 136-137.) Industry had been created largely though external influences due to the lack of markets, capital or skilled workforce regionally or nationally which was required by large-scale industry. In 1870, 40.5% of all of the industrial workforce of the country worked in Tampere. (Rasila 1984, 27.) Tampere was an island in an agrarian society, where activities were directed not by industrial logics but by pre-industrial organisations and lifestyles. Indeed, the structure of industries in Tampere was closer to that of England's Lancashire or German's Ruhr than that of the rest of Finland. Tampere was in a sense prematurely industrialised. (Haapala 1986.)

The period of 1870-1900 was an era of an unusually strong economic and population growth. If earlier growth had long relied on export markets, now the time emerged for the growth of domestic markets. Trade grew along with industrial activities as well as service and construction industries. With regard to society, the breakthrough of waged labour was the most significant incident. At the same time, industry expanded and further diversified; in 1875 the first shoe factory was founded in Tampere (Björklund 1993, 50) and the pharmaceutical industry was started in 1895. (Seppälä 1998, 56.) Broad-scale publishing activities were initiated in 1881 when the Tampereen Kirjapaino Osakeyhtiö (Tampere Printing House Ltd), which published the most prominent local newspaper Aamulehti, was founded. (Seppälä 1998, 32-33.) Aamulehti remains the leading daily paper of the region and now, at the beginning of the new millennium, is part of one of the two leading media houses in Finland, the Alma Media conglomerate. At the beginning of the 1870s, a large amount of other industrial plants from different fields were also founded. The turn of the 1890s, however, was the start of a distinctly new era. Within a few years, several textile factories were born, and by 1900 the textile industry dominated the industrial structure. In the Finlayson cotton mill alone there were over 3,000 workers. Moreover, several hammer mills and other metal factories were founded, on the basis of which mechanical engineering industry rose to be next in line to the textile industry as one of the specialised fields of Tampere. The proportion of Tampere industrial workers among the total Finnish industrial workforce during that time was 30.8%. (Rasila 1984, 22-27.)

At the same time, also the infrastructure of the town was modernised. The Tampere water supply plant was founded in 1884, sewerage began to be constructed, and electric lights were turned on for the first time in the Finlayson factory on 15.3.1882 (the generator used in Tampere was manufactured by Edison, manufacturer's number 3). The son of the owner of

the patron of the factory had been working as an intern in the Edison factory and returned to Finland with the newly developed generator. In 1888, Tampere took the pioneering step in Finland of using electric street lighting. (Björklund 1993, 115-120.)

The validity of the privileges that the Tampere industrial life enjoyed – Privilegium Tammerfors – expired in the end of 1895, but the water power from the rapids and the town's central geographical position were resources which institutional changes could not remove. The advantage of the location had reached its full capacity when Tampere got rail traffic connections to Helsinki, Vaasa and Pori. The developed industrial centre attracted new industries; it was known that Tampere had a skilled workforce and enthusiastic enterprisers. (Haapala 1986, 15, 102.) At the beginning of the period of independence (1917), all of the core fields of heavy industry were established in Tampere.

During the period of 1900-1920, the industrial workforce of Tampere was integrated as a part of Finnish society to such an extent that Tampere ceased to be an exceptional phenomenon in Finland: the rest of the country was also developing industry. The working class was born. (Haapala 1986, 15, 211.) However, in 1920 over one-half of all working people in Tampere were employed in industry, whereas the proportion in the rest of the country was approximately 10%. Relatively speaking, Tampere still had a certain special quality (Statistics Finland).

During the approximately 100-year era spanning the birth and establishment of large-scale industry, Tampere transformed from the structures of an agrarian society to the structures of an industrialised society, the society of estates became a class society, and waged work became common. (Haapala 1986, 321-322.) A feature particularly specific to Tampere was women's waged work, which did not occur in the rest of Finland on the same scale. The growth also resulted in many other social changes, and as the setting became too cramped, problems were not uncommon.

Along with the development of the industry, the need to also develop educational institutions became evident. Technical education was initiated in Tampere in 1886 with the founding of an industrial school. Its task was to provide the students with such skills and knowledge that could be demanded from masters and foremen in the different fields of industry. More advanced education began in 1912, when the Tampere Technical Institute was founded. (Björklund 1993, 141-144.) The founders and expertise largely came from abroad, but the beginning of local education also made endogenous development possible.

The 100-year period described above consists of several critical incidents, of which the clarification and expansion of the free town rights in 1821 and their continuation in 1856 had an impact on the development of the town in the form of institutions. As the preconditions for industrialisation were institutionalised, industrial Tampere was able to develop in the originally intended direction. In regard to the whole history of the town's industrial development, Finlayson were a crucial actor in the creation of an actual large-scale industry. Following Finlayson, the town found its direction. In addition to Finlayson, the central actors who significantly influenced the development of the town were the tsars of Russia (who

granted the privileges of Tampere) and the families who controlled the industrial institutions, such as the Nottbecks and Frenckells. Their influence was based not only on their role as employees, but also as participants in the administration of the town.

The era of the expansion of industry also created the structures for both an industrialised society and institutions. Industry began to take root as part of Tampere's socio-cultural deep structure; waged work was established, and industry itself was born as an institution.

5 The Expansion of Industry and the Beginning of Recession (1920-1960)

The years that followed the independence of Finland (1917) compose a strong era of the founding new companies in Tampere, and in the 1920s, several new companies were founded particularly in the field of clothing and footwear. Later on, some of these either went bankrupt or merged with other companies. Independence made it possible for Finland to practise its own economic policies and thus to decide itself, for example, about the level of industrial tariffs. The large corporations of Tampere were still primarily in the textile industry, but as the society developed, an increasingly varied number of machinery and devices were in demand to meet the needs of both industry and other lines of business, as well as households. This meant growth in the metal and mechanical engineering industries. In 1936, the proportion of metal and mechanical engineering industry as a part of the total workforce had risen to more that 12 %. The number of workers in the Tampella mechanical workshop, for instance, crossed the line of 1,000 before the World War II. As is typical for mature industrialism, the number of clerical staff grew faster than the number of workers also in Tampere's industries. (Jutikkala 1979.)

Before World War II, the metal and mechanical engineering industries grew significantly, while the textile industry which had been in a dominant position for over 100 years began to decline. This marked a new course of development with no turning back. Finally, in 1943, the metal industry rose to be the biggest industrial sector and its proportion of total workers reached nearly 27 %. Industry still provided over a half of all jobs in the town. (Jutikkala 1979.) The preconditions for industrial activities were significantly improved when the Council of State in 1931 decided to transfer the State Airplane Factory to Tampere. The decision had been preceded by a decision-making process that went on for many years. Along with the airplane factory, Tampere received its own airport, and air traffic between Helsinki and Tampere was initiated in 1937. (Seppälä 1998, 73-94.)

After World War II, Tampere was still an industrial town and over one-half of its population relied on industry for its subsistence. The amount of industrial workers continued growing until 1956, after which it began to decline. However, the number of clerical staff continued to grow. The growth of industry in Tampere, and metal industry in particular, can partially be explained by the war reparations to Russia. Of all the Tampere enterprisers, Tampella Ltd made the largest contribution. Its share of all machinery and devices that were manufactured in Finland as part of war reparations was 14%. Moreover, Lokomo Ltd was an

important reparation supplier. After 1950, the relative proportion of industrial jobs began to shift due to industrial decline and job opportunities in the service sector grew considerably. The number of personnel in the educational system, social administration and health care increased in particular. (Rasila 1992, 36, 185-189)

After World War II the development of the industry in Tampere differed from the general line of the entire country and its other towns. Tampere was an old industrial centre, where industry obviously could still expand, but the relative share of industrial working people had little room to grow. Hence, based on the amount of industrial workers the industrial development of Tampere after the World War II can be divided into two separate periods, of which the first was a period of rapid growth, with the second a period of slowly accelerating decline. When the decrease of the working force was, on the one hand, replaced by machine power (through the means of rationalisation and automation), industrial production grew until the 1980s. The year of the general strike, 1956, signified a downward turn in growth that had continued since the war for the entire country, but in Tampere the turn was steep and permanent. The peak amount of industrial workers, 31,878, was reached in the very year of the general strike 1956. The total amount of both industrial workers and clerical staff was at its height in 1962: 36,890. (Rasila 1992, 190-192.) The focus of Tampere industry even after the war was on the entity formed by the textile, clothing, footwear and leather industries, which in 1956 employed 18,000 people. By 1988, the number was only 3,900. During the war, the metal industry had reached the extent that it managed to maintain its production rates even with slight growth until the end of the 1970s. At first, the food industry represented the fastest growth, but ultimately its automation led to the reduction of workers. Another relatively fast-growing field was the graphic industry. (Rasila 1992, 193-194.)

All and all, the above-described era was in many ways a time of social restlessness. The period between the World Wars was characterised by independence, civil war, intense activities by both the far right and communists, the great depression of the 1930s and finally, the Second World War. After World War II, Finland lived the so-called years of danger in its domestic politics, which referred to the sensitive relationship between Finland and the Soviet Union. However, local politics in Tampere stabilised, and the town managed to cross the traditional gap between the political right and left in decision-making. In the 1950s, a "brothers-in-war axis" was born that was based on cooperation between the National Coalition Party and the Social Democrats and had its roots on the members' comradeship during the war. The question with regard to the development of the town was not only of political cooperation, but also of active cooperation between certain individual people in these groups. (Rasila 1992, 351.) A central figure of the brothers-in-war axis was Erkki Lindfors who became the city manager in 1957 and was known for his daring and straight-forward measures. (Rasila 1992, 368-369.) The cooperation made it possible to create predictability and long-range planning in development, and the same basic set-up continues

to prevail in the local politics of Tampere in the early 00's. Strong individual actors and the coalition they have formed have indeed been characteristic to the development of the town.

Both pre and post-war years were in many ways a restless time in Tampere. The arrival of the airplane factory reinforced the developing metal and mechanical engineering industry, and the airport that the factory drew significantly improved communications to other places. With regard to industry, a critical issue was the war reparations which resulted in the expansion and modernisation of particularly the metal and mechanical engineering industry. The 1956 general strike was a turning point in Tampere industrial life. The amount of the industrial workforce in general, and regarding the textile industry in particular, began to decline. The decline was not due to the strike per se, but the strike marked the beginning of the impending economic recession. The central local institution, the brothers-in-war axis that was essential to the attendant development of the town that was created. In practise, its members took on the responsibility for the development of the town across political parties. Perhaps the most central figure both in the axis and with regard to the general development of the town was Erkki Lindfors. The managers and owners of the factories still had influence over the development of the town, but "patrons" like Nottbeck no longer existed. One reason for this was the gradual change of the ownership towards "faceless" management.

6 The Decline of Heavy Industry and Birth of Knowledge Economy (1960-1990)

In the beginning of the 1960s, the relative proportion of industrial jobs had already begun to decline, but industry still provided over one-half of all working places in Tampere. By the turn of the millennium the relative proportion had dropped to almost 20 %, which also was the average level in all of Finland. The absolute number of industrial jobs was at its zenith in 1962, and rapid decrease only started in the mid-1970s. The amount of jobs decreased until 1995 when it began to increase for the first time in decades and stabilised on the level of approximately 20,000 working places by the end of the 20th century. (Statistics Finland.)

There were several reasons for industrial recession that reflected the interlinking of local, national and global factors. In the 1950s, the industry in Tampere was labour-intensive, and the machine power used per worker was only one-half of the national average. The production value per worker was 2/3 of the national level. Moreover, from 1945 to 1975 the real value of industrial hourly wages rose fivefold. These factors forced the industry to automate and rationalise production, and these measures indeed increased the gross value of production per worker. The oil crisis of 1974 caused problems in Finland as well as Tampere, because the country used a great deal of imported energy. The major upheavals in the Eastern Europe in the end of the 1980s, and especially at the beginning of 1990s, also caused trouble because exports particularly to the Soviet Union had been considerable. The recession of Tampere industry can be characterised as a recession of the textile industry in particular, because it was expressly the textile industry that had been so massive and which, ultimately, lost many jobs. In addition to the aforementioned factors, the development in the textile

industry was affected by the post-war development when new countries began their industrialisation in the textile industry, similar to Tampere, and managed to gain ground in the market. Moreover, the organic raw materials the Tampere textile industry used were imported. (Rasila 1992, 191-201.)

6.1 Sowing the Seeds for the Knowledge Economy by Creating New Educational and Research Institutes

Of the traditional Tampere industries, only the engineering industry managed to retain its significant role despite the industrial recession. It succeeded in renewing and developing technology of an increasingly high level. However, several mergers and rearrangements of ownership took place that resulted in ownerships being shifted to certain international corporations that are among the largest in the world. The engineering industry also knew how to exploit the possibilities that the technical university offered in their development work. Nowadays a dozen of the companies operating in Tampere are global market leaders in narrow business segments. Textile, clothing, leather and footwear industries were not able to renovate in a similar fashion, and because the fields are less complex in terms of technology, countries with lower production costs succeeded better in international competition.

New and rapidly growing business sectors have also been developed in Tampere, and especially information and telecommunications technology clusters have grown rapidly. In less than five years, the ICT sector more than doubled its size in Tampere. In 1996 there were a total of 170 firms, employing 5,200 people, with the total output of 4,590 million FIM (772 million euro). Employment increased in private firms from 3,000 in 1994 to 6,750 in 1997; an increase of 125.2 per cent. By 2000, the ICT sector employed approximately 10,000 people. If the media and new media sub-sector and the related service and commerce sub-sectors are included, according to Statistics Finland employment rises to 15,500 people. The ICT sector in Tampere is highly diversified and consists of six main areas, which are increasingly converging into a digital media cluster. (e.g. Statistics Finland, the Tampere Region Centre of Expertise Programme 1999-2006, Kautonen et al. 2002 and Kostiainen 2000.)

The economic transfromation of Tampere was not self-evident, rather local perseverance and ingenuity were also needed in the sowing of the seeds of the knowledge economy. Next, we examine how industrial Tampere was able to renew its industrial competitive edge and simultaneously strengthen the rise of new fields. The creation of the knowledge economy was largely made possible by the development of new educational and research institutes.

Getting a university in Tampere was one of the most crucial and long-term factors in terms of its future. Helsinki had a private School of Social Sciences (YKK), the basic idea of which was to offer educational possibilities for people with limited means who had not graduated from high school. Its transfer to Tampere was influenced both by thrusting forces in Helsinki and appealing factors in Tampere. The role of the institute in the Helsinki of “real” universities was not particularly strong. On the other hand, in Tampere there was a fierce will to get its own university, and the transfer was finally realised in 1960 as a result of the active

efforts of the Tampere town management. The interest of Tampere was to offer educational opportunities for young people and simultaneously prevent a brain drain. Particularly in the beginning, the town provided strong financial support to the university. In 1966, the name of the institute was changed to the University of Tampere (UTA), and in 1974 it became a state university like all the other universities in the country. All and all, the achievement of getting a university in Tampere was a display of the unanimous and strong-willed character of Tampere, but also of its ability to influence matters through Helsinki. Without the active efforts of Tampere's own people, it is highly unlikely that YKK would ever have been transferred to Tampere. (Kaarninen 2000, 13-40, see also Rasila 1992, 456-461, and about the eventful "network-utilising" developments Seppälä 1998, 126-127.)

After the university was obtained for Tampere, the town began to aspire to also found a technical university in its town. In order to achieve this aim, local persistence and cunning were again required. The matter was approached so that at first, a branch of the Helsinki University of Technology was to be opened in Tampere which could later on become an independent institution. After various adventurous developments, a Tampere branch was indeed opened in 1965 that was subordinate to the professors and administration of the Helsinki University of Technology. In regard to later development of the health care technology, the early days of the university had the interesting feature that it had started teaching and research activities in medical electronics already in 1967. (Seppälä 1998, 143-145, see also Rasila 1992, 461-464.)

Rather soon Tampere began to make arrangements to separate from the mother university, but it took a few years before the independent Tampere University of Technology (TUT) began its activities in 1972 (Ahonen 1993a, 377). In addition to teaching and research, the new university emphasised cooperation with industry. In the beginning of the 1970s there was increasing criticism about research activities ordered from outside the universities in Finland. In 1975 the Ministry of Education gave strict directives with concern to research services for companies. In Helsinki University of Techonology, for instance, the regulations destroyed research services for companies altogether. TUT, however, knew how to live with the directives, which meant that the university continued its policy that emphasised industrial cooperation and "if discrepancies of interpretation occurred, the interpretations were consistently made in the own university." (Hassi 1993, 381-382.) The Tampere University of Technology also methodically developed the supervision of activities on its own terms of contract, which later became a national standard. Expediency was the aim in decision-making processes, and at best, the entire contract negotiation process with a company could be completed in a single day (Seppälä 1998, 221-222). The active role of the universities in the externally directed cooperation becomes apparent in the fact that the relative proportion of external R&D funding in Tampere was at the highest level in all of Finland in the 1990s (Kostiainen 2000). Here the impact of TUT can be seen. TUT has been the pioneer of research services in Finland (Loimio 1998, 33).

Especially the role of the Tampere University of Technology in transferring expertise to companies was strong from the very beginning, and in fact the legislation concerning TUT required investing also in product development (Wacklin 1995, 73). The obstinacy of the TUT was crucial for its role as a "university of industry", when cooperation with companies was not favoured by the Ministry of Education. TUT's cooperation with industry was indeed close. It can even be said that without the industrious and extroverted activities of TUT, the metal and mechanical engineering industries could not have renewed themselves to rise to the international top of their fields in the 1990s through the means of new technological expertise. This view is strongly supported by interview research that was conducted in 1998 among the management of the core engineering companies in the region. (Sjöholm 1998.)

In addition to the universities, the foundation for the knowledge economy was laid by the renewal of legislation concerning the Technical Research Centre of Finland (VTT) in the early 1970s which gave the institute the opportunity to found branches also outside of Helsinki. Along with the TUT, Tampere expertise was growing and from the viewpoint of the VTT it was becoming an interesting place for research. Hence, in 1974, laboratories of medical and occupational safety and health were established in Tampere, and later in the 1970s also the textile laboratory was transferred to Tampere (Ahonen 1993b, 387). By the mid-1970s a basic structure of solid and versatile academic teaching and research was created in Tampere as if from nowhere. It was complemented with intermediate-level educational institutes, of which particularly the Technical Institute received high regard also in wider circles.

6.2 The Birth of New Fields of Expertise and the Development of Institutions for Technology Transfer

From the very beginning, the two universities of Tampere were active in many ways. One of the critical incidents that later proved to be significant was the creation of a professorship of computer sciences in 1965 in UTA, which was the first in Nordic countries. Reino Kurki-Suonio held the chair, and he was a core actor when the students and the recent graduates in the field founded the first software company in Tampere, Softplan. Softplan had a remarkable impact on the development of Tampere-based information technology and worked, for instance, for Nokia. When Nokia's needs grew, it took over the entire firm. For some time, Softplan was a subsidiary to Nokia but in 1986 it was joined as part of the Nokia Data product development department. Some of the employees left for other places, but some continued in different units of Nokia. The expertise acquired in Softplan continued to exist in different places and the workers of Softplan transferred to prominent positions in other companies. (Tampereen informaatioteknologian...)

After the University of Tampere openings, the foundations for Tampere-based information technology was largely created in the Tampere University of Technology. One significant event was the appointment of young Yrjö Neuvo as professor of electronics in 1977. He specialised particularly in the field of digital signal processing (Loimio 1998, 32). From the

very beginning, Neuvo worked in active cooperation especially with industry, and he contributed for instance to the development of mobile phone technologies. In 1993, Neuvo was invited as the research and development manager of the Nokia Mobile Phones and also became a member of the governing board of Nokia. (Tampereen informaatioteknologian...).

Finland's first technology centre was founded in Oulu in the beginning of the 1980s. In Tampere a debate on the usefulness and necessity of a technology centre was also initiated. In 1986, Kiinteistö Oy Hermia was founded in order to construct a technology centre in the immediate proximity of the Tampere University of Technology. Hermia gradually expanded to the extent that in 2001 there were 145 companies with the staff of nearly 3,000 operating in its premises of 100,000 m^2. It was realised already in the very beginning that next to the physical environment, also contentual development activities were necessary. Hence, in 1986, techonology transfer company Tamlink Ltd was founded to promote the product development cooperation between companies and TUT. Moreover, in 1990 the Tampere Technology Centre Ltd. was founded for contentual development work of the technology centre. (Uskallettuja unelmia… 6-12.) In 1985, TUT, the University of Tampere, the City of Tampere, and the business interests founded a Research Institute of Information Technology which concentrated particularly on digital image processing, artificial intelligence, automation technology and micro processors (Seppälä 1998, 235). The institute developed into an important co-operative partner to companies, and generally into a core actor in the Tampere-based cluster of information and communications technology. Later it changed its name to the Digital Media Institute and in the end of the 1990s it was, for instance, selected to be a Centre of Excellence in its field by the Academy of Finland (Loimio 1998, 32).

The role of the Nokia Corporation in the development of Tampere during the past 15 years obviously can not be ignored. During its history, Nokia has practised several different kinds of activities in Tampere, but the activities connected to information technology increased when Nokia bought Softplan in 1986. In 1988, Nokia started the Nokia Cellular Systems in Tampere which develops mobile phone systems. The internationally solid expertise of TUT in electronics and information technology was a significant factor in bringing Nokia coming to the city. The operations were in a constant process of expansion with regard to the both two main business groups, Nokia Mobile Phones and Nokia Networks. Products developed in Tampere include the Cellular Data Card and Nokia Communicator, as well as the NMS/2000 of net management. The personnel of Nokia grew rapidly particularly towards the end of 1990s. The unit, which initially started with some tens of people, grew into the largest private employer in Tampere with almost 4,000 workers (Kautonen et al. 2002; Tampereen informaatioteknologian...). All and all, towards the end of the millennium, the development of Tampere was positive regarding to engineering, health care technology, ICT and communications industries. (Statistics Finland; CityWeb.)

In the end of 1960s, research and teaching connected to medical electronics was started in Tampere, and in 1974 a VTT laboratory of medical technology was founded in town.

Professor Pertti Törmälä of the TUT started the development work of especially strong biomaterials that dissolved in the human system in 1970s, which led to the commercialisation of the products in 1984. (Uskallettuja unelmia, 12.) The foundation formed by the Faculty of Medicine of the University of Tampere and the Tampere University Hospital was considered to be so solid that "health care technology" could have the opportunity to develop in to a new field of strength in the Tampere region. Towards the end of 1980s, preparations were indeed started for the founding of a new technology centre that would expressly specialise in health care technology in the near proximity of the University Hospital, as well as for the founding of a specialised development company. However, the time was not yet ripe in the end of 1980s for realising these kinds of plans, but it was not until 1995 that the first part of the technology centre Finn-Medi was completed and the development company Finn-Medi Research Ltd. began its activities. One crucial factor for the development of the entire field of health care technology was the fact that it was chosen as one field of the Tampere Region Centre of Expertise Programme. (Seppälä 1998, Läätek Project, the Tampere Region Centre of Expertise Programme.)

The most important critical incidents in regard to the birth of the knowledge economy were the arrival of the university and the technical university to the city. The active work of many individuals was interwoven in the background of these incidents. The two educational institutes created the foundation for the transfer from industrial society to information society. In fact, according to many studies, they later became the most important resources of the knowledge economy, and core factors concerning the appeal of Tampere in the competition for an expert workforce (Raunio 2000; Kautonen et al. 2002; Kostiainen 1999 and 2000).

The examples of information technology and health care technology tell us that knowledge accumulates slowly, and that there are several individual solutions and decisions behind development. As a whole, they can form a new path even though at the time of the decision-making the formation of the path may be impossible to detect. In the birth of a new path of knowledge such individual actors are also needed, who can further the matter through their strong personal input. The main architects of the birth of the Tampere knowledge economy were not enterprisers, investors and industrial managers as in the birth of industrial Tampere, but perhaps surprisingly were the "fathers" of the city - the leading officeholders and elected officials. Getting the university into Tampere may have been the most important individual critical incident, because it opened up the opportunity for new, wide-ranging thinking. When the transfer of YKK was seriously taken up for discussion, the city manager and the central politicians of the brothers-in-arms axis were the core actors in the project. (Rasila 1998, 456-457, 463, Seppälä 1998, 125.) The City of Tampere has had an important role in many critical incidents; perhaps not as much as a creator of ideas but rather as a quarter that has been ready to even take big risks and make quick decisions (about the spirit of the decision-making and

the roles of the different actors see Seppälä 1998). The decisions and measures taken by the city have created institutional thickness and opened up new processes.

All and all, it was not at all self-evident that Tampere, which had held a central position in the industrial society, was to be renewed also as a success story of the information society and knowledge economy. Tampere had had time to develop a reputation and modes of operation as a strong industrial town, but it could have very well been locked in to its past path without any real possibilities to renew its economic basis. Moreover, there is reason to arrive at the tentative conclusion that the active role of individual people and certain key groups in the creation of new institutions planted the seed of a fresh path of development in Tampere; new blood arrived in town with new prevailing perceptions of the future which opened up the opportunity to detach from the past path and make a new one. However, at that time the development of knowledge economy had not yet been institutionalised as part of development activities. It had largely been based on the visions, thoughts and efforts of individual people. Many basic ideas of the new urban economic policy – such as the founding of the technology centre and the development companies – were better understood when the "official Finland" began to emphasise their importance.

7 The Systematic Institutionalisation of the Knowledge Economy (1990-)

As Cooke (2002, 168) states, during the last 20 years Finland has consciously built new economy clusters in many regions of Finland and unlike many other countries those policies have been succesful. The Finnish economic and industrial policies have indeed been in the midst of a strong renovation process since the 1980s and especially since early 1990s as the knowledge economy began to be methodically developed. Concepts such as the national innovation system, cluster, knowledge, internationalisation and networking became part of public discourse. Certain elements of the national innovation system were already developed in the 1980s and, for instance, the National Technology Agency (TEKES) was founded to develop technology expertise. The development was accelerated by the deep recession of the early 1990s, which was the last straw to force Finland into a strong structural renewal. In the midst of the recession, the Finnish government and many companies invested in R&D activities. Until the end of the 1980s, Finland had lived according to the logics of industrial society, even though the problems in industrial life had been recognised; in the 1990s a relatively fast turn of direction took place. (Kansallinen teollisuusstrategia 1993; Katsaus 1990…; Tiedon ja osaamisen… 1993.)

The change in the society and thinking patterns was also reflected in regional policy. One result of the new thinking was the launching of the national centre of expertise programme in 1994. The basic idea of the programme was to strengthen the already existing strengths instead of the previous course of eliminating defects. The Centre for Expertise Programme attempts to construct clusters of internationally high-level expertise (here the changes in

policy-making are seen only from the regional policy point of view but there were also changes also in science and technology policies).

The Tampere region also prepared a competition proposal in which mechanical engineering technology, automation and information technology and health care technology were put forward as fields of expertise (The Tampere Region Centre of Expertise Programme). The Tampere region did achieve its goal of being nominated as the centre of expertise in these fields. However, national status or the granted relatively small coordination funding were not essential, but rather the fact that the chosen economic fields gained a certain kind of "strategic status". In the earlier urban economic policy programmes in Tampere no stand had been taken in favour of any particular field of expertise, line of business or cluster, which meant that strategic choices for the focal points of development had not been made. Moreover, the programme made it possible to gather together the central actors of these fields of expertise to joint development work, and the centre of expertise became an important forum for cooperation. The choices were also just right for complementing each other; mechanical engineering represented the traditional field of expertise in Tampere in which several internationally prominent companies already operated; information technology in its part verged on a rapid growth along with Nokia, and as far as health care technology was concerned, firstly Finn-Medi was about to be completed, and secondly strong faith in general was put in health care technology both in Finland and in Tampere. Health care technology was seen to have lots of future potential. Moreover, along with the Tampere Region Centre of Expertise Programme came a shift to cluster-based development thinking.

7.1 From Provincial Centre to Node in Global Networks…?

In the mid-1990s, the centre of expertise programme had been initiated, and the chosen fields of expertise all developed in a positive direction with regard to both sales and the amount of workers[3]. The national industrial policy discourse was dominated by the theme of the knowledge economy and information society[4]. Tampere had developed in the same direction, but a certain kind of formal verification was still missing; perhaps the strong industrial culture and tradition obstructed the ultimate transfer from the emphasis on industry to emphasis on knowledge. On the other hand, many traditional industrial companies had faced major crises (for example, during the recession) and undergone internal renovation, and hence were able to create new kinds of strategies based on technology and core competencies. In practise, many metal and mechanical engineering industry companies started to apply high technology in their own production in the 1990s.

[3] Source: the Cityweb information system of the City of Tampere, in which the development of the selected industrial fields are followed as clusters in the terms of sales and the total sum of wages that describes the amount of workers.

[4] See e.g. Suomi: Tiedon ja osaamisen yhteiskunta, Reilu ja rohkea – vastuun ja osaamisen Suomi, Katsaus 2000. Tiedon ja osaamisen haasteet and Elämänlaatu, osaaminen ja kilpailukyky – Tietoyhteiskunnan strategiset kehittämisen lähtökohdat ja päämäärät.

After the mid-1990s, the knowledge and expertise-based economy was institutionalised as part of the Tampere development thinking through the means of strategic planning. The urban economic development strategy of Tampere that was published in 1998 was initiated on the basis of Manuel Castell's space of flows thinking, and competitiveness was especially seen as the ability to attract desired flows, as well as the ability to instil different functions essential to development into the city (see Kostiainen 1999). At the same time people and companies were connected together in a way quite different than before, and concerning the development of Tampere, the "feeling like home" of both of the groups was considered essential. Previously, it was largely thought that in urban economic policy it is important to create new jobs, whereas in the new strategy the dynamic interaction between workplaces and skilled workforce was emphasised, and consequently, the notion that a skilled workforce attracts new companies and new jobs, particularly in the fields that require high-level expertise. It was also felt to be particularly important that the strategy should clearly define those clusters whose development would be focused on. The Centre of Expertise Programme, which was already started, provided a basis for the choices of the economic development strategy, and thus engineering and automation[5], health care technology, information technology and tourism were chosen as strategic focal points (Tampereen tulevaisuus…).

The core significance of the new strategy was in that through its means, a) development activities based on expertise, technology, innovation and knowledge were stabilised; b) the increasing of institutional thickness was continued by founding new strategic development companies to be responsible for the development activities of the chosen focal point fields; and c) the target level of the development of the city was raised.

Taking the knowledge economy as the point of departure of development and raising the target level can be illustrated by comparing the strategies of 1998 with the urban economic development policy programmes of 1987 and 1990. Core differences from the thinking that is behind the 1998 strategies are that there was already a clear shift to cluster-oriented development and those strategic clusters to which development activities are directed were chosen. Moreover, a clear difference can be seen in how the city perceives its own regional role; in the programme of 1987 Tampere is seen as a "provincial centre" and a "location of national sub-activities". Moreover, the strategy remarks upon the "label and legitimacy of an industrial city". In 1990, "knowledge" is already emphasised, and by 1998 it has changed into an explicitly defined "knowledge-intensity" and the development of the city into an "exemplary European city of life-long learning". (Tampereen elinkeino-ohjelma 1987-2000, Tampereen elinkeinotoimintojen kehittämisohjelma 1990-1995, Tampereen tulevaisuus….)

When the new centre of expertise programme was under preparation in 1998, the traditional Tampere expertise field, communications, was seemingly rediscovered with the growth of the new media industry. Already for many years, research and teaching in the fields of journalism and mass communication had been conducted in Tampere. The first radio

[5] During the first stage of the programme, automation was transferred from the connection with information technology to connection with engineering.

broadcast in Finland had been transmitted from Tampere in 1923 and TV broadcasting activities had also been started in the end of 1950s (Ahonen 1993b, 308-311). Hence, information technology, engineering, health care technology, communications and knowledge-intensive business services for companies were proposed as the fields of expertise in the new programme proposal. Researchers had paid close attention to knowledge-intensive business services and their significant role in the innovation system after the mid-1990s (see e.g. Haukness 1997 and Miles et al. 1995), and a study on them had also been conducted in Tampere in 1998 (Kautonen et al. 1998). However, the national panel did accept other fields as part of the programme, but left out knowledge-intensive business services. Nevertheless, in Tampere it was firmly believed that it was well worth developing knowledge-intensive business services, and therefore it was decided that their development would be continued through the means of local funding without official programme backing.

The emphasis on networking is characteristic to the Tampere development concept, and particularly the so-called strategic development companies (in which the city is involved as one of the owners; the ownership base of each company depends of the field in question) have a significant role as developers of the chosen clusters: Tampere Technology Centre Ltd is responsible for ICT and engineering clusters, Media Tampere Ltd for communications clusters, Professia Ltd for knowledge-intensive business services, and Finn-Medi Research Ltd for health care technology. (Kostiainen 2001a, the Tampere Region Centre of Expertise Programme 1998-2000, Tampereen seudun…)

In the words of Sotarauta and Lakso (2000, 85), Tampere had transformed to "an attractor of innovative milieux" in the 1990s. In other words, Tampere seemed have an attractive magnetism which drew population growth, the growth of jobs in the new economy, the expansion of innovative activities and strengthening of the image, among other things. These factors began to shape up into a self-reinforcing process; the good image supported the improvement of the appeal of the city, which in turn attracted new experts, new companies, commenced new processes, which again strengthened the image and so on.

The significance of knowledge and innovations had been internalised in different quarters, but at the same time there was the insight that further steps must be taken and the target level raised. In order to take the next step, the preparation of a new, broad development programme was started in 2000. It was named eTampere. The objective of the eTampere programme was to develop Tampere into the world's leading researcher, developer and applicator of the information society. The strengthening of the knowledge base of the region, the creation of new business activities and the development of a new public net service were set as the new principal lines of operation. The sum total of the budget of the five-year programme was 132 Me. The programme consists of seven different sub-programmes and its central implementers, in addition to the City of Tampere, are TUT, UTA, VTT and the companies in the region. (see www.etampere.fi; Kostiainen 2001b.) Hence, in less than 15 years, the set of objectives had shifted from the attempt to be a "provincial centre" to the attempt to develop

into a “world-class” operator with regard to information society, namely, one of the nodes of the network society. (see Kostiainen 1999.)

In the 1990s, the knowledge economy in Tampere became institutionalised as a central part of the development of the city. In this chapter, strategic plans and programmes were utilised to illustrate the change in the thinking patterns rather than to begin to evaluate the impact of the new strategy in the development of the city. Evaluation is further complicated by the fact that one of the researchers (Juha Kostiainen) acted as the business development director of the City of Tampere in the end of the 1990s, and hence was an official responsible for development activities. For this reason we do not assess the relationship between the strategy and the realised development in this connection, but resign ourselves to note that in several connections the competitiveness of Tampere is evaluated as excellent, and it has clearly risen to one of the top cities of the knowledge economy in Finland next to Helsinki and Oulu. (see Huovari et al. 2001, Kaupungit: Muuttohalukkuus 2000, Raunio 2000.)

A general change in the perceptions that direct development from the background is apparent in the fact that instead of individual actors, a large group of people working in different organisations had committed themselves to the development of knowledge economy. The role of individuals can be significant as builders of networks or transmitters of visions, but above all the knowledge economy is promoted better by institutional thickness and the combination of different kinds of competencies than by lone rangers. The realisation of this way of thinking has promoted development also in Tampere. At the same time, it is essential to realise that the planting of the seeds of earlier phases of development, namely, the creation of institutions, has provided the development community with resources and institutional frameworks on which it is possible to construct a variation of activities.

8 Conclusion

Behind the founding of the town of Tampere was a new kind of economic perception. The opportunity for industrialisation opened up, and was based on the vision that the location of the coming town was at a great advantage on the isthmus between two lakes, on the banks of powerful rapids. The new economic perception that was based on an emerging spirit of times and also on national decision led to the creation of new institutions. They provided the actors with the opportunity to utilise the most central resource of the newly founded town: the rapids. Freedom and resources attracted new actors, and hence the seed for the development path of Tampere was planted. The fact that the rapids as a resource, freedom and the Russian markets attracted “global expertise and resources”, namely, James Finlayson, held a significant position in the reinforcement of the chosen new path. There is reason to say that Finlayson gave a significant impulse to the birth of large-scale industry.

The development path created in the beginning of the 19th century began to strengthen, and industry was gradually institutionalised as part of Tampere’s socio-economic deep structure. World War II reinforced industrial development in Tampere at least in two ways:

firstly, manufacturing goods that were part of the war reparations to Soviet Union reinforced industry; and secondly, a decision-making culture was created known by the name brother-in-arms axis. Hence the fast, anticipatory and long-term, but at the same time very centralised decision-making culture was born and in the course of time also institutionalised.

The industry of Tampere grew until approximately the mid-1950s, but after that time a gradually accelerating recession began. The recession was due to local, national and global reasons, and after a difficult times the mechanical industry succeeded in transferring to a new development path, but textile industry lost a great number of jobs. At the same time, however, the seeds of new path were planted. Amidst the strong industrial era after World War II, the notion of Tampere's own university began to be brought up increasingly often in the discourse on the development of Tampere. This was not at all inevitable in an industrial city with a strong political left. The new perceptions gained supporters from the brother-in-arms axis and at a fast tempo Tampere managed to "usurp" two universities from Helsinki. They brought along people who represented new kinds of perceptions, and hence the seeds of the new path had been planted in the middle of strong industrial development path in the form of new institutions and new actors.

Later the regeneration of thinking on a national level helped to lay the foundation for new economic thinking in Tampere too. At the turn of the 1980s and 1990s, the national level began to invest in a national innovation system, the development of technology and the raising the level of education. Tampere also quickly adopted knowledge economy and theme of the information society. Institutional thickness was systematically increased and in addition to the technology centre, special network of specialised development companies were created to boost development. The success of Nokia, which was linked with Tampere through its strong product development, increased faith in the future.

The new institutions and actors reinforced the newly born perception that emphasised technology, expertise and education, and through their own activities began to deepen it. As the perceptions strengthened, the new actors gradually gained more space, but only when the surrounding society started to change on a broader level was Tampere able to utilise the new institutions systematically and extensively. At the same time, the universities had become the core resources of Tampere. The rapids no longer had significance as an economic resource.

According to Cabun (2001), Merenne-Schoumaker has noted that the models of regional economic development are not as much geographical but political projects which local actors initiate. Therefore, according to her, it is not possible to deduct general models of regional development from them. According to Merenne-Schoumaker, these kinds of general models create a false sense of security because they conjure up an illusion that it is possible to control global resources by mobilising local actors. On the basis of examining the past development of Tampere there is reason to second Merenne-Schoumaker's view: the development of Tampere has indeed been a political project in which local interests have had a great significance. However, the question is not of Tampere (i.e. its local elite) trying to control

global resources, but rather that by mobilising local actors and expertise it has been attempted to develop institutions, structures and processes so that the responding ability of the city develops and the nexus to different global flows and networks improves. Hence, the objective is to develop the city in such a way that, on the one hand, it has the ability to better root important activities in it in order for global flows not to drain them away; and on the other hand, attract new activities to it. The question is therefore not actually one of the control of global resources, but of the development of the city's own ability to act as part of global networks and flows.

Global and national factors have indeed clearly influenced the development of Tampere. Changes in the global markets have challenged firms of Tampere to change and especially to increase the efficiency. National resources and programmes have set the framework for new policy initiatives and provided city with some resources, but in spite of this there is reason to consider that Tampere has not been at the mercy of global forces or its transformation a result of national progammes, resources and/or decisions. Tampere has been able to strategically adapt to each phase of social and economic development as a pioneer. Here strategic adapting refers to the sensitivity to recognise various changes and to adapt to them, but at the same time to create the city's own perception of each phase of development, as well as its own "story of development" and its support. In the practice of the Finnish policy-making, national, regional and local often blur and it is not possible to fully understand economic transformation in Finland and in its cities, and the role of policy-making in transformation processes focusing only on multi-level governance issues; in order to understand how various policy-broders and levels are crossed and how new policies are in practice created and implemented more studies focusing on complex policy-networks are needed.

At all events, in Tampere the creation of new knowledge-intensive clusters, as well as the partial renewal of traditional industrial fields took place in the span of approximately 40 years, knowledge accumulates relatively slowly. Past development indeed denotes to current and future development, but Tampere case shows that great leaps are also possible by conscious efforts (see also how Oulu [Jussila 1997; Sotarauta & Linnamaa 1998] and Jyväskylä [Linnamaa 2001] have broken out to a new path). Finnish cases show that path dependency can be broken, but they also show that the promotion of economic development itself is path dependent. In Tampere the views of the new development crystallised step-by-step from the visions of a few brave individuals into official thinking, the subsequent development measures would not have been possible without the seeds planted much earlier. Thus we see path dependency also from policy-making point of view; for us *path dependent policy-making* is a way of understanding activities pursuing economic change, consciously and unconsciously, as a process of cumulative causation where the dominant feedback loops are self-correcting and futures seeking, as they at the same time they contain self-reinforcing features.

Based on Tampere case, and other Finnish cases too, we propose that following features as significant in self-correcting and futures seeking and thus path breaking transformation processes:

- *The capacity for bold and fast decisions in the community is important in opening opportunities for a new path* - If succesfull this capacity may be institutionalised in the community and become a local pride and essential part of local culture. Previous successes or failures either strenghten or weaken capacity for bold decions. This feature requires also a good-quality local policy-network and brave individuals (see Sotarauta & Linnamaa 1998).
- *Brave and visionary inviduals and innovative coalitions formed by them are often needed in creating conditions for a new path* – Core coalitions formed by innovative and determined individuals often plant the first seeds of something new in the midst of the different spirit of times and its institutions and culture; they are acting against the tide. Leadership seems to be in crucial role in breaking out of old path (see also Linnamaa 2001; Sotarauta & Bruun 2002.)
- *Creative tension mobilises and motivates individuals and various collectives to pursue change* - Development efforts need the sense of drama that can be found in a crisis, possible crisis, great opportunities, appealing vision etc. Creative tension is a state that is based on excitement, ambiguity and uncertainty over future events and consequences of our actions (see more about creative tension Sotarauta & Lakso 2001).
- *Spirit of times is a soil in which new path is rooted* – Spirit of times shapes the development view of many actors. In Tampere more collective implementation of "knowledge economy" strategies was easier when spirit of times in Finland as a whole changed, and when knowledge economy and related issues were discussed everywhere, i.e. in the media, conferences, literature, etc., and when the national bodies began to channel resources into it. Local "inspirers", the champions of development efforts, were thus able to utilize general societal discourse in their own argumentation. Spirit of times is one of the key resources in institutionalising new path. The seeds of new path are, however, often planted against spirit of times (see several case studies Sotarauta & Bruun 2002).
- *Institutions, resources and interpretations root the city to a new path* - Tampere (its key-actors) made conscious efforts to free itself from the past path and to create a new one by creating new institutions, by seeking out new resources to build on and by creating a new interpretation of the city-region, its current state and future prospects. One of the reasons that the development work of Tampere proceeded well is the fact that in the earlier phases of development new institutions and resources (at first they were relatively insignificant in relation to the prevailing institutions and culture of the time) have either emerged or been designed that could be utilised later by a more systematic strategic development approach.

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The Local Innovation Systems Project

The Local Innovation Systems Project, an international research partnership based at the Industrial Performance Center (IPC) at MIT, is addressing a central issue now confronting industrial practitioners and economic policymakers throughout the world: How can local economic communities survive and prosper in the rapidly changing global economy?

Our particular focus is on the role of innovation – in products, services, and processes – in promoting productivity growth and competitive advantage at the local and regional levels. National and local governments around the world, as well as other institutions with an interest in economic development, are greatly interested in creating and sustaining local environments that are attractive for innovation. Firms, too, recognize that their innovation performance is affected by their location.

The policy debate has been dominated by a few outstandingly successful centers of technological entrepreneurship, notably including Silicon Valley and the Boston area in the United States, and the Cambridge region in the U.K. But most locales do not have clusters of high-technology ventures of such scale, nor are they home to research and educational institutions with world-class strengths across a broad range of disciplines. Many, on the other hand, do have distinctive industrial capabilities and vibrant higher educational institutions, and some of these locales have been quite successful in harnessing new technology to revitalize their economies or even to reinvent themselves as centers of innovation and competitive advantage.

The Local Innovation Systems Project is investigating cases of actual and attempted industrial transformation in more than 20 locales in the United States, Europe, and Asia. Our research is aimed at developing new insights into how regional capabilities can spur innovation and economic growth. We seek ultimately to develop new models of innovation-led industrial development.

We are currently completing the initial year of a projected multi-year study. In the first phase of research, we are investigating the roles of universities and other public research institutions as creators, receptors, and interpreters of innovation and ideas; as sources of human capital; and as key components of social infrastructure and social capital. Later phases of our research will explore the process of enterprise growth and the ability of different locations to attract and retain innovating firms. We are also investigating different approaches to individual and institutional leadership in locally-based systems of innovation.

The founding research partners of the Local Innovation Systems Project consist of an interdisciplinary team of faculty, graduate students and research staff at the MIT Industrial Performance Center, together with their counterparts at the University of Tampere and the Helsinki University of Technology in Finland, the University of Cambridge in England, and the University of Tokyo, Japan.

Current research sites include several locations in the United States (Boston, MA; Rochester, NY; Akron, OH; Allentown, PA; Youngstown, OH; Newhaven, CT; Charlotte, NC; and the Greenville-Spartanburg area of SC), Finland (Helsinki, Turku, Oulu, Tampere, Seinajöki, Pori), Japan (Hamamatsu, Kyoto), and the United Kingdom. Additional research

is being carried out in Ireland, India, Taiwan and Israel.

At each location, teams of researchers from the partner institutions are studying innovation trajectories and developing comparative case studies of growth and transformation in several industries, mature as well as new, including polymers, ceramics, optoelectronics, industrial machinery and automation, auto/motorsports, medical equipment, biotechnology, and wireless communications.

The outreach activities of the Local Innovation Systems Project will include the preparation of discussion papers and books, executive briefings and informal workshops, international conferences, and executive education and training programs for policymakers, research managers, and industry executives.

Current sponsors of the Local Innovation Systems Project include, in the United States, the Alfred P. Sloan Foundation and the National Science Foundation, Tekes (the National Technology Agency of Finland), the Cambridge-MIT Institute, and the University of Tokyo.

For further information, please contact the Project Director, Professor Richard Lester (617-253-7522, rklester@mit.edu).

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Our particular focus is on the role of innovation – in products, services, and processes – in promoting productivity growth and competitive advantage at the local and regional levels. National and local governments around the world, as well as other institutions with an interest in economic development, are greatly interested in creating and sustaining local environments that are attractive for innovation. Firms, too, recognize that their innovation performance is affected by their location.

The policy debate has been dominated by a few outstandingly successful centers of technological entrepreneurship, notably including Silicon Valley and the Boston area in the United States, and the Cambridge region in the U.K. But most locales do not have clusters of high-technology ventures of such scale, nor are they home to research and educational institutions with world-class strengths across a broad range of disciplines. Many, on the other hand, do have distinctive industrial capabilities and vibrant higher educational institutions, and some of these locales have been quite successful in harnessing new technology to revitalize their economies or even to reinvent themselves as centers of innovation and competitive advantage.

The Local Innovation Systems Project is investigating cases of actual and attempted industrial transformation in more than 20 locales in the United States, Europe, and Asia. Our research is aimed at developing new insights into how regional capabilities can spur innovation and economic growth. We seek ultimately to develop new models of innovation-led industrial development.

We are currently completing the initial year of a projected multi-year study. In the first phase of research, we are investigating the roles of universities and other public research institutions as creators, receptors, and interpreters of innovation and ideas; as sources of human capital; and as key components of social infrastructure and social capital. Later phases of our research will explore the process of enterprise growth and the ability of different locations to attract and retain innovating firms. We are also investigating different approaches to individual and institutional leadership in locally-based systems of innovation.

The founding research partners of the Local Innovation Systems Project consist of an interdisciplinary team of faculty, graduate students and research staff at the MIT Industrial Performance Center, together with their counterparts at the University of Tampere and the Helsinki University of Technology in Finland, the University of Cambridge in England, and the University of Tokyo, Japan.

Current research sites include several locations in the United States (Boston, MA; Rochester, NY; Akron, OH; Allentown, PA; Youngstown, OH; New Haven, CT; Charlotte, NC; and the Greenville-Spartanburg area of SC), Finland (Helsinki, Turku, Oulu, Tampere, Seinajöki, Pori), Japan (Hamamatsu, Kyoto), and the United Kingdom. Additional research

is being carried out in Ireland, India, Taiwan and Israel.

At each location, teams of researchers from the partner institutions are studying innovation trajectories and developing comparative case studies of growth and transformation in several industries, mature as well as new, including polymers, ceramics, optoelectronics, industrial machinery and automation, auto/motorsports, medical equipment, biotechnology, and wireless communications.

The outreach activities of the Local Innovation Systems Project will include the preparation of discussion papers and books, executive briefings and informal workshops, international conferences, and executive education and training programs for policymakers, research managers, and industry executives.

Current sponsors of the Local Innovation Systems Project include, in the United States, the Alfred P. Sloan Foundation and the National Science Foundation, Tekes (the National Technology Agency of Finland), the Cambridge-MIT Institute, and the University of Tokyo.

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