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Marina van Geenhuizen
Marielle Damman
Peter Nijkamp

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THE LOCAL ENVIRONMENT AS A SUPPORTIVE OPERATOR IN INNOVATION DIFFUSION

MARINA VAN GEENHUIZEN*
MARIELLE DAMMAN**
PETER NIJKAMP***

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* Dr. Marina van Geenhuizen is Senior Research Scientist at Delft University of Technology, School of System Engineering, Policy Analysis and Management, and Free University Amsterdam, Department of Regional Economics.

** Marielle Damman is Research Assistant at the Free University Amsterdam, Department of Regional Economics.

*** Dr. Peter Nijkamp is Professor of Regional Economics at the Free University Amsterdam, Department of Regional Economics.

ABSTRACT

Spatial patterns of technology diffusion determine the capacity of regions and cities to compete in a global market. It is therefore, important to know in what way the local environment can contribute to the attraction of new technology to business locations and what factors differentiate in the support of the local environment in this process.

The article will take its starting point in the knowledge capacity of cities. It will then discuss conventional theory on spatial diffusion and review some merits of this theory. Furthermore. a focused approach will be introduced by adopting a communication perspective on technology diffusion. This perspective allows for an exploration of potential barriers (and bridges) in the diffusion process. The article will then present new empirical results on the supportive role of the local environment in technology diffusion on the basis of a large sample of innovative companies in various European cities. Particular attention will be given to the role of the local institutes of higher education and research. This article will conclude with some policy recommendations on an improved use of the local environment in advancing the competitiveness of innovative companies.

Introduction

Cities - or urban regions - are dynamic and self-organizing artifacts: they are the result of creative design, architectural implementation. land use policy and management of human resources within a cohesive framework imposed by their cultural and politica1 history. Modern cities have become multi-faceted economic. social, cultural and environmental systems making up an organic assembly of multiple interacting subsystems. As a result, cities exhibit complex evolutionary patterns in which growth and decline are in turn present. Thus the iife cycle of cities seems to demonstrate a stimulus-response dynamics which is omnipresent in business life. Therefore. ït makes sense to interpret urban dynamics in terms of a Schumpeterian search for new strategies that ensure continuity in changing - and often competitive - conditions [1]. Deliberate innovative strategies to rejuvenate city life are necessary as the challenges and problems facing cities are numerous. complex and difficult to manage. Examples are: the govemance of balanced human co-existence in the city (e.g., social exclusion and high unemployment rates) and the management of urban capacity and density problems (e.g., urban environmental sustainability, urban traffc).

In light of the great many challenges of the modem city, there is also a tendency to emphasize the new role of the city as the creator of a portfolio of locational opportunities (e.g., the agora city, the 'glocal' city. the resourceful city etc.). The main question is of course whether sufficient and effective govemance strategies - in both the public and the private sector - can be deveioped that guarantee sustainable urban development [2]. In this context, it ought to be recognized that the city is a privileged spatial - economic actor as a result of scale and urbanisation advantages. A city is in principle able to produce positive extemalities which favour innovative behaviour [3], in particular if multifunctionality. openness and spatial interaction is present. Thus the functional network character of the city is decisive for its innovative potential.

European cities are increasingly losing the protection provided by

national borders. Vanishing borders mean the opening of regional economies to new networks and new social and economic influences, introducing particularly an increased *competition* between cities [4]. In a dynamic competitive environment the absorption and generation of new technology in an urban economy is of paramount importance for the future role of that city. At the same time a strict enviromnental policy is needed to prevent that the basis for sustainability is eroded: non-sustainable urban growth implies by necessity that the whole urban economy will witness a process of socio-economie (and environmental) decay in the long run. It is therefore important to know in what way the local environment can contribute to the attraction and generation of new technology to urban business locations.

Technological innovation by companies can essentially be viewed as a form of management of change [5]. A typical feature of change is *uncertainty* on the outcome of the change (planned and unplanned) and the conditions that lead to different outcomes. In a recently developed approach to urban and regional innovation the focus of analysis is on the capacity of the local environment as an uncertainty-reducing operator [6,7]. Accordingly, barriers to diffusion and adoption are bridged in strict integration and synergy with the firm. The mechanisms work through a collective and socialised process which allows for cost reduction and increase of effectiveness of decision-making of local firms. The uncertainty-reducing functions of the local environment broadly encompass the following activities: search for information. selection, signalling, transforming and transcoding of information, as well as the performance of control functions [6]. However, whether such network structures and positive externalities arise and sustain is very much dependent upon the *institutional* framework in the city-region. In industrial relations one can observe a basic difference between models of horizontal coordination and models of vertical integration [8]. The former enables much easier a flexible response to fast moving changes, while the latter causes much more rigidity between actors. Such differences in business models and network culture are essentially rooted in the socio-economie history of cities and regions.

This article will first interpret knowledge capacity as the backbone of the European city, while it will next discuss conventional theory on spatial

diffusion and review some of the debates in this field. The article will proceed with empirical results on the supportive role of the local environment for innovative companies in various European cities. Particular attention will then be given to the role of the local university in the process of technology diffusion. Furthermore. it will be explored which factors cause a differentiation in the role of the local environment in this process. The study will conclude with some policy recommendations on an improved use of the local environment. particularly its knowledge capacity.

Knowiedge Capacity as the Backbone of the European City

It is increasingly recognized that the knowledge capacity is a major asset in the economic competitive power of cities. A well-developed knowledge capacity improves the innovativeness of city-regions and hence their economic development. Despite its importance. the urban knowledge capacity as a *comprehensive* concept - including the generation, attraction. availability (access) and use of knowledge, and the linking of the relevant actors - has seldom been investigated empirically in relation to the urban innovation capacity.

Each city has a knowledge base. resting in the resident population, knowledge institutes (e.g. universities, public research institutes) and companies. It is much more than that contributed by forma1 processes of education and training of the urban labour force. Knowledge in the urban economy comes from a plethora of internal and external sources: from training and education. accumulated experience. from suppliers, advisors and customers. from professional meetings and casual conversation, from local research and development, from migrant company investment and intracompany transfer, from media, libraries, data bases and patents, and from commercial generators of knowledge.

The urban knowledge capacity includes five essential activities performed by urban actors [9]:

Management of stocks of *knowledge*. This includes providing access to archives, libraries. etc., and more importantly, modemizing skills of the resident population and labour force.

Networking in order to advance knowledge flows. Networking is important in the transfer of knowledge from creator to receiver. It is also essential in the creation of synergy between different actors and disciplines. Networking is further necessary to improve the integration of the knowledge capacity in the local society and to connect local actors with global sources of knowledge.

Creation of new knowicdge. This activity occurs well-structured and planned in universities. research institutes. and companies. However, new knowledge is also the result of unexpected events and processes, such as a casual conversation in a pub and failure (or sideways) in research experiments.

Commercial use of knowledge. Major commercial users are companies and increasingly. privatised sections of governments. Use includes both clear-cut 'pieces' of practica1 knowledge and inventions which stil1 need a long development before they can be commercialized.

Education and training. This includes forma1 education such as by universities. art schools. and company schools. It also includes training and elaboration of local crafts using informal channels.

Universities are often viewed as urban focal points of generation of knowledge, in addition to research and development departments of large companies and public research institutes. Knowledge transfer from universities towards the business world may take various forms. Well-known examples are science parks and transfer centres. but university-industry transfer operates mainly directly between scientists and companies, for example, in contract research or joint research programmes.

Intermediary institutions like transfer centres have recently received attention. particularly regarding the occurrence of various innovation and diffusion

barriers [10.111. The type of potential barriers (in view of universities) can be summarized as follows:

smal1 interest in commercialization among university academics
different aims and lead times of research projects in universities and companies
competition and missing links between various sources and intermediaries
lack of transparency and appropriate image of universities as sources of knowledge.

It seems true that these types of barriers hamper particularly knowledge transfer between universities and locai smal1 and medium-sized enterprises (SME).

Apart from transfer of knowledge. there is the valorization issue of knowledge producing activities. The so-called *synergetic* effect of the often multifaceted knowledge types (science. art. fundamental and applied science) is seldom used. This 'missing link' follows among others from mental barriers, disciplinary diversity and lack of occasions to work together on joint projects.

Companies are facing a progressively high uncertainty and risk, mainly due to the pervasive nature of new (generic) technologies, such as information and communication technoiogy, biotechnology and new materials. and new modes of organisation and production. In addition. the increasing global competition and the shortening of technology life cycles have progressively increased the need for new knowledge. Different kinds of 'knowledge' are relevant for company managers: technical. commercial, managerial. and public policy (including mandatory requirements and potential sources for assistance).

There is a trend among companies to satisfy their knowledge needs by means of *external* sources. There are many different extemal sources [9]:

licenses and new means of production (machinery. equipment)
acquisition of innovative companies

forma1 networking in various configurations, such as wirh competitors, suppliers, customers and research institutes (including outsourcing of R and D)

informal networking in clubs. branch institutes, etc.

human resource management (attracting new employees. retraining existing workforce).

Companies may act as receivers as well as sources of knowledge, dependent on their activities. Knowledge relationships are formed. maintained and broken by companies in an intentional way in view of the perceived value in a particular strategic context. Networking in technology diffusion involves different types of organisational modes. Two important dimensions in this respect are the strength and duration of the ties. associated with different levels of *organisational interdependence* [12]. From a company perspective, a distinction can be made between casual links with smal1 interdependence (such as one way advising by a particular knowledge source) and links which constitute a tight, (semi)permanent cooperation (such as joint ventures).

The previous discussion underlines the need for a thorough investigation of the structure and network functioning of the urban knowledge capacity and actual use of this function.

Spatial Diffusion Theory

Spatial pattems of technology diffusion are of paramount importance, since they determine the capacity of cities and regions to compete successfully in the world market economy. 'Classical' theory on spatial innovation articulates usually a *hierarchical* diffusion process. In this vein, Thompson [13] advanced the hypothesis that inventions tend to become successful innovations in the large metropolitan areas of economic core regions of industrialized countries.

Three reasons have been put forward to explain a hierarchical diffùsïon

[14]. First. information availability varies over space in such a way that information flows tend to be dense and contain a relatively large amount of new knowledge in large cities. In addition. specialized information is often transferred interpersonally. Accordingly, a hierarchical diffusion process is based on the probability of entrepreneurs to learn about new knowledge, and this probability increases with the size of the town. A second reason is the risk-minimizing behaviour of companies in the 'front line' of a new technology. In order to avoid market uncertainty they exploit first the most profitable locations - being the large markets of large cities -, and later on more risky smaller centres. A third reason is the abundant availability of factors of production in large cities. The early adoption of an innovation requires easy access to various types of inputs. supplied either in the market (such as qualified labour and capital) or by investment of social overhead capita1 (such as traffic and communication infrastructure. research-oriented universities) [3].

More recently. debates on spatial innovation and diffusion have come to articulate the role of ***smaller*** cities [15.16.17]. Accordingly, specific smaller cities have become new global centres of creativity and nodes in knowledge exchange networks. What is different in 'new' locations is that they are much more focused than older ones on accommodating and attracting creativity and knowledge, by providing education of cognitive skills, creative organisations. including various cultural facilities. This focus on knowledge seems also evident in a relatively highly educated and skilled population. Furthermore, the cities or smaller towns involved provide modem communication, including high speed railroad and large capacity telecommunication. What these new locations also often share is the absence of an economic past dominated by mining or traditional manufacturing [15.18.19].

Aside from a hierarchical pattern, a ***contagious*** pattem of diffusion is emphasized by various authors [20.21]. In a contagious pattem, the diffusion of knowledge is concentrated in the vicinity of the originating source and decays strongly with distance from this source.

While the above theories articulate the availability and access to information (supply side). there are also theoretical views on spatial diffusion tlíat

focus on the *receptivity* of companies for information, based upon particular company characteristics (demand side). This type of approach to spatial diffusion assumes different needs and capabilities to obtain new technology among potential adopters [22.23], such as based upon sectoral composition, company size and position of companies in corporate organisational structures (e.g., branch piants) [24.25].

More recently, the attention has focused on socio-cultural and strategic 'distance' as an influential factor in diffusion patterns [26,27]. For example, in the strategic 'distance' approach it is emphasized that the acceptance of new products and processes is never an isolated action because it follows the historica1 growth path and present strategic context of companies. Thus, when production scale and methods. and product-markets constitute a favourable setting regarding the requirements and benefits of the irmovation. the 'strategic' distance is small. implying a large chance for adoption.

A further different approach is the one that regards diffusion as a process of communication. with senders and receivers as principal actors [28]. In this approach much attention is paid to the emergence of barriers. Barriers to communication have a disruptive influence on communication and information flows. indicated by discontinuities in the intensity of these flows [29]. They have a widely different origin [11,29,30], such as the information (technology) self. and senders and receivers. The technology self may be expensive and complicated causing a delay in diffùsion [3 1]. Barriers may also follow from low (perceived) benefits from the new technology. A further source of bar-riers are low skill levels among senders and receivers, for example. with regard to the matching of supply and demand. and with regard to the identification of benefits of diffusion.

Many barriers to communication have a *socio-cultural* background and affect both senders and receivers. Language is far the most important barrier here, preventing an adequate coding as well as decoding and reception of messages. Language barriers include spoken. written and computer language, as well as the vocabulary used in communication. The latter barrier type follows, for example, from different stages in the development of the technology (basic and applied), and

from differences in the organisational culture between sender and receiver [28.32].

To conclude, when using a communication perspective a large variety of potential barriers to diffusion of technology can be revealed. We now turn to an empirical exploration of the role of the local environment in bridging these barriers.

The Supportive Role of the Local Environment

The role of the city in corporate innovation rests first and foremost in the urban labour market. This can be illustrated with a European-wide study [33], in which the labour market (actual skills and potential skills) is ranked first among a large number of different urban attributes (Table 1).

Managing technological change involves more than acquiring new technology. It includes the ability of the company to transform the knowledge into new products and processes. Thus. workers that operate new equipment or perform new laboratory experiments have to be found in the local (regional) labour market. Lower levels of management have also to be filled from this labour market. A shortage of qualified and experienced personnel on various levels seems to be the most important problem here [34]. The supportive role of the local labour market for technology diffusion is strongly related to the ability of local (regional) educarional institutes to deliver educated persons on the desired leve1 and in the desired numbers. But the role of the local labour market is also dependent upon the quality leve1 of the urban housing market. particularly the ability to offer good housing for highly educated workforce [35].

A further important position is held by network attributes of the urban environment, witness the high ranking of the quality of telecommunication (representing immaterial network access to the global world) and specific (technology) links with local universities (Table 1). Thus, potentials for networking within the city and beyond are clearly important for innovation. This is consistent with the growing realization that the local and the global go hand in hand. without a sacrifice of the local [36].

Table 1 **Rank order of most important urban assets (a) according to firms in various European cities (rank order)**

We turn now to an in-depth analysis of the supportive role of the local environment. based on a smaller sample of companies in European cities (Annex 1). The companies have been selected in such a way that they reflect current conditions of innovative companies in various manufacturing branches. Using the items mentioned in Table 1 a comprehensive score has been calculated per company, indicating the overall importance of the city in the recent past (1980s) and the near future (1990s) [37]. A score of 0 means that none of the local attributes is important, whereas a score of 100 means that all city attributes are important for a company (Table 2).

When we focus in on product and process innovation. it becomes clear that the overall importance of the city is rather modest and apparently largely resting on the previously mentioned local labour market and network attributes. Most firms have relatively low scores. with higher scores for product innovation compared with process innovation (witness 23% and 11% medium and high scores, respectively). Furthermore. the distribution of scores reveals a smal1 trend towards an increased importance of the city in the near future.

Table 2 **Importance of the city for European entrepreneurs**

The previous section has focused on a genera1 supportive role of the local environment. The next section will pay attention to the specific role of the local environment in technology diffusion by the local university.

Diffusion Through the Locai University

Universities are first and foremost producers of knowledge. In a more

detailed way the output of the university can be classified into human capital, research-based knowledge and knowledge-related external services. This section will consider the participation of urban companies in commercial knowledge (service) networks and human capita1 links with the local university. In the analysis a further important distinction will be made between casual (short-term) and structural (comprehensive) relationships (Table 3).

Regarding commercial transfer. one can observe a difference in participation dependent upon the strength of the link. Services on casual request are more popular than (semi)permanent relarionships based upon contracts or agreements on ownership. witness the average participant shares of around 32% and 12% in each category, respectively. Similarly. human resource management (HRM) links including upgrading of skills (expertise) of existing employees are more popular than recruiting new employees from universities. witness the participation in training for technical qualifications and short courses (shares of 5 1 and 46%. respectivelyj and the recruitment of technical and management staff (shares of 27 and 13%. respectively).

The previous figures underline the importance of the urban environment in terms of labour market potentials. It als0 stresses an overall preference of companies for casual and short term links.

Table 3 Firm participation in university links in various European cities (percentage share)

A Differentiated Look at City Importance

Aside from importance of the city for product and process innovation, our analysis also includes the generic importance of the city for innovative companies in terms of their daily operations (Table 4). Compared with product and process innovation. the city importance turns out to be much larger. Most companies are in the medium range (almost 60%). In addition. almost a quarter of all

companies attach a large importance to the city environment. Apparently, there is a comprehensive daily use of the urban environment by innovative firms which is not directly connected with product and process innovation. Furthermore, similar to the importance of the city for innovation. one can observe a smal1 increase of importance attached to the city in the next coming years (Table 4).

Table 4 Genera1 importance of the city for European entrepreneurs

Firms are no homogeneous category of actors. First. they have different needs for new technology and (broadly speaking) uncertainty reducing information. as well as different capabilities to satisfy these needs by networking. Second. firms may be diverse in their capability to function as bridging actors in urban communication networks. For these reasons. our analysis includes subclasses of firms based upon age. size. innovative leve1 of the branch. and in-house R and D (Table 5). In addition. the location of firms may be diverse regarding potentials for information gathering and processing. Based upon classica1 viewpoints we have selected city-size as a differentiating factor to be explored.

Table 5 Trends in the genera1 importance of the city for European entrepreneurs

The results of the analysis can be surnmarized as follows. Older companies tend to attach more importance to the local environment than younger companies. The same holds for large companies compared with smal1 ones. It needs to be emphasized that all companies in the study are established companies in the sense that they had clearly passed the first risky years of existence at the time of the research. What the difference in valuation then might indicate is that young (and small) companies have not yet fully developed local networks. or a fine-tuned balance between local and global networks. This view is supported by the observation that the differentiating influence of age (and size) is weaker

regarding the near future (Table 5).

A further difference in city importance can be observed between companies with different levels of innovative activity. Highly innovative companies (indicated by branch and in-house R and D) tend to attach more importance to the city than low-innovative companies. The technology and market uncertainty of the former is apparently (partly) reduced by established local networks and global networks with the city as anchor-hold. Finally, companies in large cities tend to attach a higher value to the local environment than companies in smal1 towns. This indicates that large cities provide (or are expected to provide) a full range of labour market and network opportunities. which is usually not the case in smaller towns despite the new knowledge function of some of them. With regard to the future. it can be concluded that the importance of the local environment tend to increase for both highly innovative companies (indicated by branch) and companies located in large cities (Table 5).

Policy Conclusions

The above analysis has demonstrated that due attention for the promotion of local networks - within the city and positioning the city as a centre of a broader knowledge network - is warranted. The functional network character of the city is decisive for its innovative potential.

The urban knowledge capacity is a comprehensive and complex phenomenon. which needs an integrative policy approach. The following characteristics of the urban knowledge capacity are worth mentioning in this respect:

multiple actor and multiple role situation
multi-faceted
multi-layer policy (management) framework.

The different actors involved in the urban knowledge capacity have

usually *diverse aims* in relation to knowledge, such as improving the competitive edge (firms) and creation of high technology jobs (local governments). In addition, particular actors perform different roles at the same time. Universities are involved in many activities (creation of new knowledge, education and training, advancing knowledge flows, and increasingly also commercial use of knowledge). Local governments are involved in the management of knowledge stock (e.g., libraries) and in supplying channels (meeting places) for networking. Local govemments are also important users of locally derived knowledge. To further illustrate the complexity: companies are both active as in-house creators of knowledge and users of knowledge from outside.

The urban knowledge capacity is *multi-faceted.* leading to the need for a multidisciplinary approach. It involves. for example, aspects of science dynamics and serendipity, micro-economic behaviour of firms, sociology of clubs and informal networks. and economics of public finance. A further cause of complexity is the policy (or management) framework of the urban knowledge capacity which is essentially *multi-layered.* The local municipality is important as it sets particular locai conditions to the knowledge capacity, such as the availability of premises for companies and housing for particular income groups. At the same time, public and private actors at higher spatial scale levels influence the urban knowledge capacity to a considerable degree. For example. multinationals can decide to open or close down a local laboratory, while national governments can decide to increase or cut down research budgets at universities, and to fix the maximum number of new students in particular faculties. Particularly the relationship between national governments. companies and universities is currently being changed [38], with potentially important local impacts.

Clearly. there are many barriers in the functioning of cities in knowledge networks. This justities an active technology support policy in order to exploit all opportunities offered by the local entrepreneurial climate. Such a policy needs to be sector-specific and well tuned to the needs of a variety of actors. The results of this study indicate that particular attention ought to be given to highly innovative companies because their dependence on the local environment seems to increase' in

the next coming years.

In addition. the observation that a stronger importance is attached to local characteristics in large cities than in smaller towns, justities a new policy attention for large cities. Such an attention needs serve two aims, i.e., a further advancing of the inherent locational advantages of large towns and a preventing of the rise of 'diseconomies of agglomeration'. The latter make competing and surviving of companies relatively difficult, such as labour market shortages and shortages in telecommunication and transport infrastructure (e.g., congestion) [39.40.41].

The results discussed here. point to two classes of city attributes which need particular policy attention, namely the local labour market (with an emphasis on the matching of demand and supply) and network characteristics of the urban knowledge capacity. Regarding the latter, the advancing of opportunities for casual and short term networking between companies and local universities (or any other major knowledge source) deserves most attention.

Annex 1 Structure of the sample

The sample of 273 firms has been structured on the basis of different criteria. namely country, city, and sector. Three *countries* join into the sample. i.e. Italy, the Netherlands and the United Kingdom. Within these countries various *cities* have been considered. The Italian firms are in the cities Como and Milan, and the Dutch firms are in Rotterdam and Eindhoven. The firms in the United Kingdom are in a larger number of cities. of which Sheffield and Newcastle are important examples. With regard to the *sector*. a subclassification of manufacturing has been developed on the basis of the following procedure. The companies were drawn first from the machinery sector in each city. and secondly from sectors that could be regarded as important for the city concemed. using employment numbers and value added statistics at a two-digit ISIC classification, i.e.. the largest sector in terms of employment. the sector with the highest employment growth rate. and the sector with both the largest output growth and a stable/declining employment ('jobless' growth). To illustrate this selection of sectors, the Dutch companies are in the machinery industry, chemical industry, electrotechnical industry, transport equipment industry, food industry, and textile industry.

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Table 1 **Rank order of most important urban assets (a) according to firms in various European cities (rank order)**

	Product Innovation	Process Innovation
Skills in labour market	1	1
Skills training support	2	2
Quality of telecommunication	3	3
Technology links with local universities	4	5
Quality of int. transport links	5	9
Local customers	6	11
Local suppliers	7	8
Local investment subsidies	8	6
Favourable attitude of local politicians	9	7
Local business services supporting technology	10	4

(a) Ten assets (from a total of twenty-one). N = 488.

Source: Adapted from Traxler et al. (1994).

Table 2 Importance of the city for European entrepreneurs

Classes of Scores	Recent past		Near future	
	Abs.	Share (%)	Abs.	Share (%)
Product Innovation				
Low (0-30)	212	7s	202	74
Medium (3 1-65)	43	16	49	18
High (66- 100)	18	7	22	8
Total	273	100	273	100
Process Innovation				
Low (0-30)	243	89	224	82
Medium (3 1-65)	21	8	31	11
High (66- 100)	9	3	18	7
Total	273	100	273	100

Source: Adapted from Damman (1994).

Table 3 Firm participation in university links in various European cities (percentage share)

	Share (%)
COMMERCIAL TRANSFER	
Casual	
- Consultancy and advice	32.9
- Testing and analysis	31.6
Structural	
- Sub-contracting	13.9
- Joint ventures	9.3
HUMAN CAPITAL	
Short-term	
- Short courses	46.0
- Technical qualification	51.0
- Management qualification	36.1
- Workshops	26.4
- Seminars	30.9
Staff recruitment	
- Technically qualified staff	27.0
- Management trainees	13.9

Source: Adapted from Damman (1994).

Table 4 Genera1 importance of the city for European entrepreneurs

Classes of Scores	Recent past		Near future	
	Abs.	Share (%)	Abs.	Share (%)
Low (0-30)	46	17	34	12
Medium (3 1-65)	162	59	167	61
High (66- 100)	65	24	72	26
Total	273	100	273	100

Source: Adapted from Damman (1994).

Table 5 Trends in the genera1 importance of the city for Emropean entrepreneurs (a)

Company categories	Recent past (b)	Near future	
		Reinforced/ Remaining	Weakened
AGE			X
Old	+		
Young			
SIZE			X
Small	-		
Medium	+/-		
Large	+		
BRANCH		X	
Traditional			
Modem			
Very modem	+		
IN-HOUSE R&D			X
Presence	+		
Absence	-		
L OCA TION		X	
Small city	-		
Medium-sized city	+/-		
Large city	+		

(a) Based on crosstabulation.

(b) + = relatively strong importance; - = relatively weak importance; +/- = intermediate importance.

Source: Adapted from Damman (1994).