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SPATIAL IMPACTS OF ICT ON HOME AND WORK: CHANGING INEQUALITIES

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1. Introduction

Dutch national government and local governments have laid down in regional implementation agreements that between 1995 and 2005 some 600,000 dwellings will be constructed on so-called VINEX locations in or close to the cities. Industrial estates will also be developed. Housing construction and setting out industrial estates are perceived to be separate tasks: there are different actors, working on different locations, with different purposes. All this development is completely in the spirit of the *Chartes d'Athènes* of the CIAM that marked its 50th anniversary in 1998.
The restructuring task in Dutch cities is also huge. It involves mostly post-war residential districts with a high proportion of social rented dwellings in middle and high rise buildings; these districts are ripe for redifferentiation and improved urban design. They are usually characterized by a modest level of services and facilities and shopping provision that flourishes with moderate success. Business activity and employment are hardly to be found in these districts: for those you must search on the industrial estates outside the city, or in the inner city.

Information & Communication Technology (ICT) is the collective term for all the technologies used in communication and information. So perceived, ICT includes the newspaper, radio, television, and telephone. In practice the term usually refers to those techniques which are interactive, where communication and information are intertwined, and use is made of chips and computers. Communication can run via personal computers (internet), via interactive digital television (iDTV), and via Wireless Application Protocol (WAP) telephones. These modern ICT applications are currently soaring and will doubtless have consequences for people's time space budgeting (Louw, 1991). Computers and telephones can be linked to a person (laptop, cellular, telephone), or used in a specifically designed work location, or can be found in the home. The location of the television set is predominantly the home.
Directly and indirectly, the ICT explosion which is currently underway will influence our way of life, our homes, and the residential environment. This contribution explores the spatial impacts on housing and employment. The exploration has been based on lit-

erature sources and common sense, but the observations have no more significance than pictures conjured up by tea leaves lying at the bottom of an empty cup. Setting up a research agenda centred around this theme of the influence of ICT applications on the home, the residential environment, the location of business and the city would seem to be extremely worthwhile.
Section 2 deals with the spatial relation between home and work over time. The vision of Toffler on the future of the home-centred society is explained in section 3. In section 4 we present some empirical evidence on the development of ICT and internet use in the Netherlands. The opportunities for working at home are dealt with in section 5. The economic vitality of the city is threatened as a result of the spatial impacts of the old economy (section 6). In section 7 we consider the possibilities to strengthen employment in residential districts. We conclude with a sketch of possible future developments in section 8.

2. Home and work: separation in time and space

In the past we knew how to keep home and work entirely separate - not only in space, but also in time. For decades we had a razor-sharp distinction between working hours and free time. The opening hours of shops and offices with a service counter function harmonized with that. Holidays were not spread out: either we were all at work, or we were all free.
This sharp geographic and temporal distinction between home and work is not something inherent in the human existence, but is a typical consequence of the industrial age. If business activity and employment predominate in industry it is sensible to separate the clean, fresh air of the residential areas from the noisy work environment with its unsavoury emissions. And if it only makes sense to work when the machine park is in operation, with all the wheels in the production apparatus turning, it is logical that working hours should be sharply separated from free time.
In the pre-industrial age this was quite different. The farm is typically the place where work and living are intertwined. That is also true for the shopkeeper's family living over the shop, or the tradesman whose house and work are bound strongly together in time and space. The labour market and the housing market used to be integrated in a distinctive manner (Vance, 1966). Only since the nineteenth century has a more or less independent housing market marked itself off and now we take it for granted that this is how it should be. But, in the information age this is very much the question. In the following we examine critically the assumed self-evident nature of the division of home and work in space and time.

3. The vision of Toffler

The idea that ICT applications could have radical consequence for our way of life and our homes is not new. Twenty years ago Toffler announced that the new computer assisted production techniques would lead to a new function for the home. Toffler asserts (1980: 204): '…. we are about to revolutionize our homes as well'.

Toffler describes how at the time of the industrialization (The Second Wave) millions of jobs were moved from the home to the factory and the office. The third wave will bring these jobs back from factory and office to the home. The third wave marks the transition from an industrial society to a knowledge based society. The new production techniques bring *'…a return to cottage industry on a new, higher, electronic basis, and with it a new emphasis on the home as the centre of society'* (Toffler, 1980: 204). That marks not so much a new formula, but the return to honour of a pattern that served humankind for roughly 10,000 years and was only broken relatively briefly for three centuries before and after the industrialization (see: Vance, 1966). But now another sort of production is involved: knowledge and services are pivotal; goods come in the second place.

Toffler concluded in 1980 that many people were already carrying out their work wholly, or to a large extent at home: sales representatives, architects, designers, consultants, psychologists, therapists, music teachers, insurance agents, researchers, and so forth. These groups form the advance guard in the transformation from centralized work to the 'electronic cottage'. Toffler is not blind to the barriers which will be encountered here, such as the need for face-to-face contacts with colleagues, but nevertheless he sees an irresistible shift from office and factory to the home, partly as a result of the rapidly changing trade-off between transport and telecommunication. Commuting is becoming more expensive in time and money, while telecommunication is becoming cheaper and faster. The transport of information is much more simple and environmentally friendly than the transport of people or goods.

Toffler expects households to function increasingly not just as a living unit, but also as a work unit. Toffler states (1980: 213): *'… it is worth observing that one of the things that has bound families tightly together through history has been shared work.'* Toffler anticipates increasing pressure from citizens demanding that if work **can** be done at home, then it **ought** to be done at home. Toffler (1980: 214 217) foresees the 'home-centred society' taking shape around the 'electronic society', with a number of striking consequences:

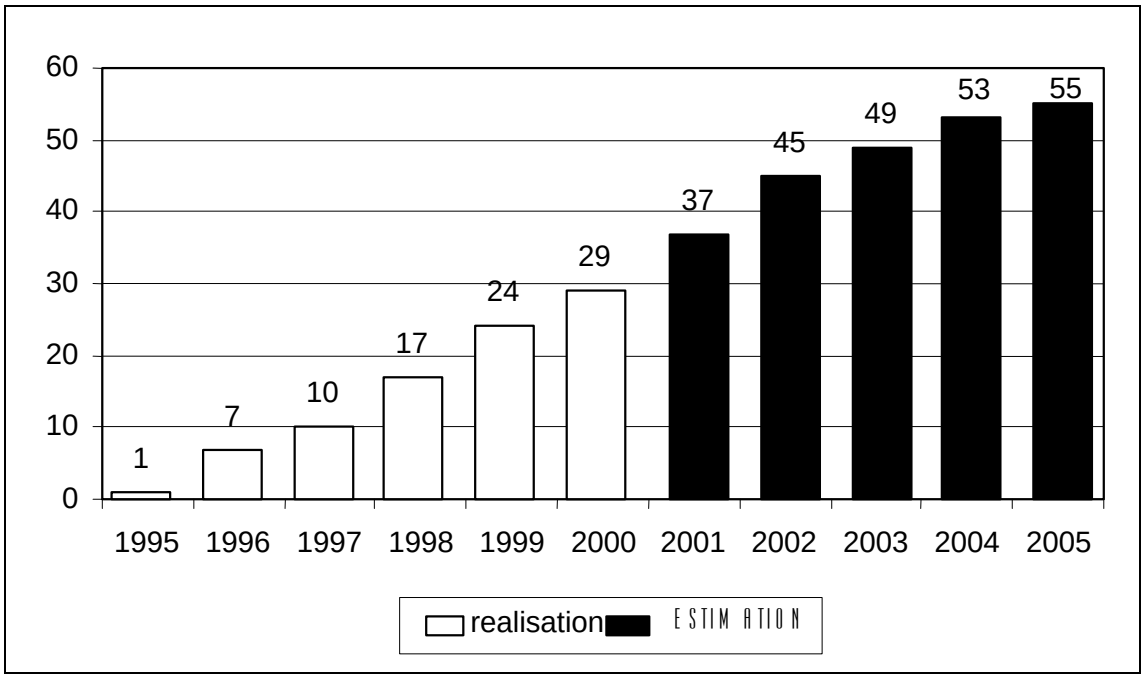
1. *Community impact*: As more people work at home, greater stability of communities will accrue. Home to work mobility will decline.
2. *Environmental impact:* Working at home facilitates the decentralization of energy production (sun, wind) and reduces the emissions from commuter traffic.
3. *Economic impact*: Shifts will occur in the production structure. Oil companies, the auto industry, the paper sector and the commercial real estate sector will fall back. The computer, communication, services and knowledge sectors will see their share grow. Toffler expects a growth of small businesses, with entrepreneurs who themselves own the means of production and only offer their services as independent producers, or in small groups.
4. *Psychological impact*: People will increasingly have to deal with two worlds: the real world and the virtual world. Toffler expects that many people will work part-time at home and part-time somewhere else.

All in all Toffler expects changes in the 'techno-sphere' to lead to a revolution in the 'info-sphere' and the 'socio-sphere'.

4. What happened since Toffler presented his vision?

Recently in the Netherlands there has been considerable attention paid to the development of E-commerce: the sale of products on the internet. ABN-AMRO (1999) describes E-commerce as the exchange of information, services, products, and payments via an electronic medium. The electronic media include not only the internet, but also the digital telephone network and cable television.
An important distinction within E-business is drawn between Business to Consumer (B2C) and Business to Business (B2B). B2C relates to sales by businesses to consumers via the electronic highway. B2B refers to transactions between companies via the digital network, including internet, in the support and implementation of business transactions (Stec Group, 2000: 11).

Figure 1 Internet use in the Netherlands (as a percentage of the total population)



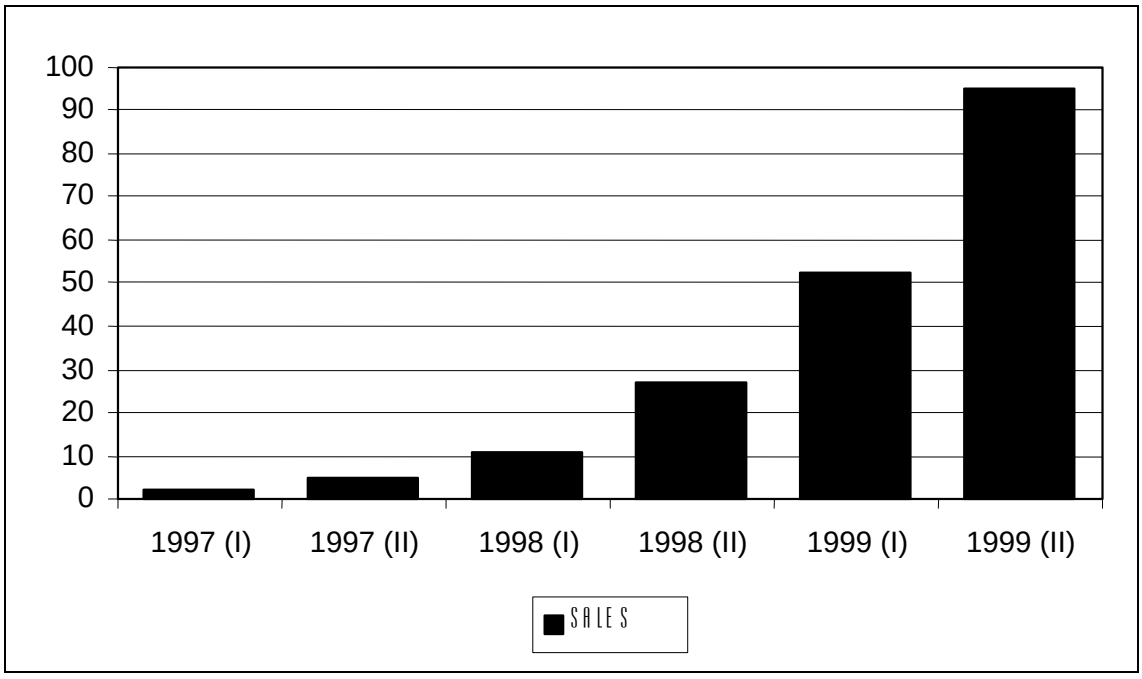
Source: Heliview 2000; EIM 1999; Booz, Allen & Hamilton 1999, Pro Activ International 2000; processed by Stec Group.

At the end of 1998, ninety million people in the world were connected to the internet. This number is rising fast. In 1998, six out of ten households in the Netherlands had a computer. The higher the income, the greater the computer ownership.
Figure 1 shows the rapid growth in the use of the internet in the Netherlands since 1995. In 1997, 10% of the Dutch had internet access. In 2000, this share has risen to 29%. A share of 55% is expected for 2005.

Forrester Research (2000) expects that in 2005 more Europeans will go on-line via the television set than via the computer. Booz, Allen & Hamilton (2000) expect 80 million

mobile telephones in Europe to be equipped with internet in 2003, partly through the development of ADSL (Asymmetric Digital Subscriber Line).
Netherlands households use internet mostly for e-mail (85%), looking for information (62%), surfing (61%), downloading (57%), and reading the news (50%). For business purposes the Dutch use the internet for e-mail (75%), information gathering (62%), downloading(39%), reading the news (38%) and searching for information (32%) (Pro Active International 2000, Stec Groep, 2000: 13).
Figure 2 shows how the on-line sale of products has grown in the Netherlands since 1997.

Figure 2 On-line sales in millions of euros, per half year in the Netherlands



Source: Blauw New Media Consulting in NRC, 2000, quoted in Stec Groep, 2000.

This growth is closely linked with the growth of the number of active internetters. In June 1999 this group of active internetters amounted to 1.5 million people, of whom 400,000 were on-line shoppers.
An important target group of E-business directed to the consumer (B2C), is consumers with lots of money and little time. The *Woongemak* [Housing Comfort] system introduced into 700 dwellings on the Java island in Amsterdam is directed particularly on to this group. The heart of this system is the *Bode*, a dedicated piece of equipment with a television screen and a printer that can be linked to a camera at the front door. The participating residents order their shopping and services via the television screen. In the near future thousands of dwellings in fifteen cities will be provided with *Woongemak*.

The real estate investor Vesteda has acquired a majority interest in the company (Stec Groep, 2000: 61).
Most of the Dutch who have made purchases via the internet are young, male, and well educated. According to Blauw New Media Consulting, in 1999 Netherlands consumers spent 147 million euros via the internet. In particular hardware and software is sold via the internet: this makes up 33% of all expenditure via the internet. Travel follows with 25%; entertainment (books, CDs) form 20% of the spending via the internet (Stec Groep, 2000: 14).
Forrester Research (2000) expects the business carried out in Europe via the internet to grow by an average of 98% per year for the next five years. The on-line sales would then rise from 2.9 billion euros in 1999 to 175 billion euros in 2005, which would be 7% of the total retail trade. Experts anticipate this share reaching 15% in the long term.
Homework is defined in various ways; that largely accounts for the substantial differences in numbers of homeworkers estimated or registered. Homework always involves carrying out work at home, at a distance from the work organization. De Vries (1998) lists four items which can determine the definition:

- the place where work is carried out: the home, or some location which is different from the employer's establishment;
- the legal status of the homeworker: employee, freelancer, or independent;
- the nature of the activities: traditional or telehomework;
- the quantity of working time spent on work at home: duration and frequency.

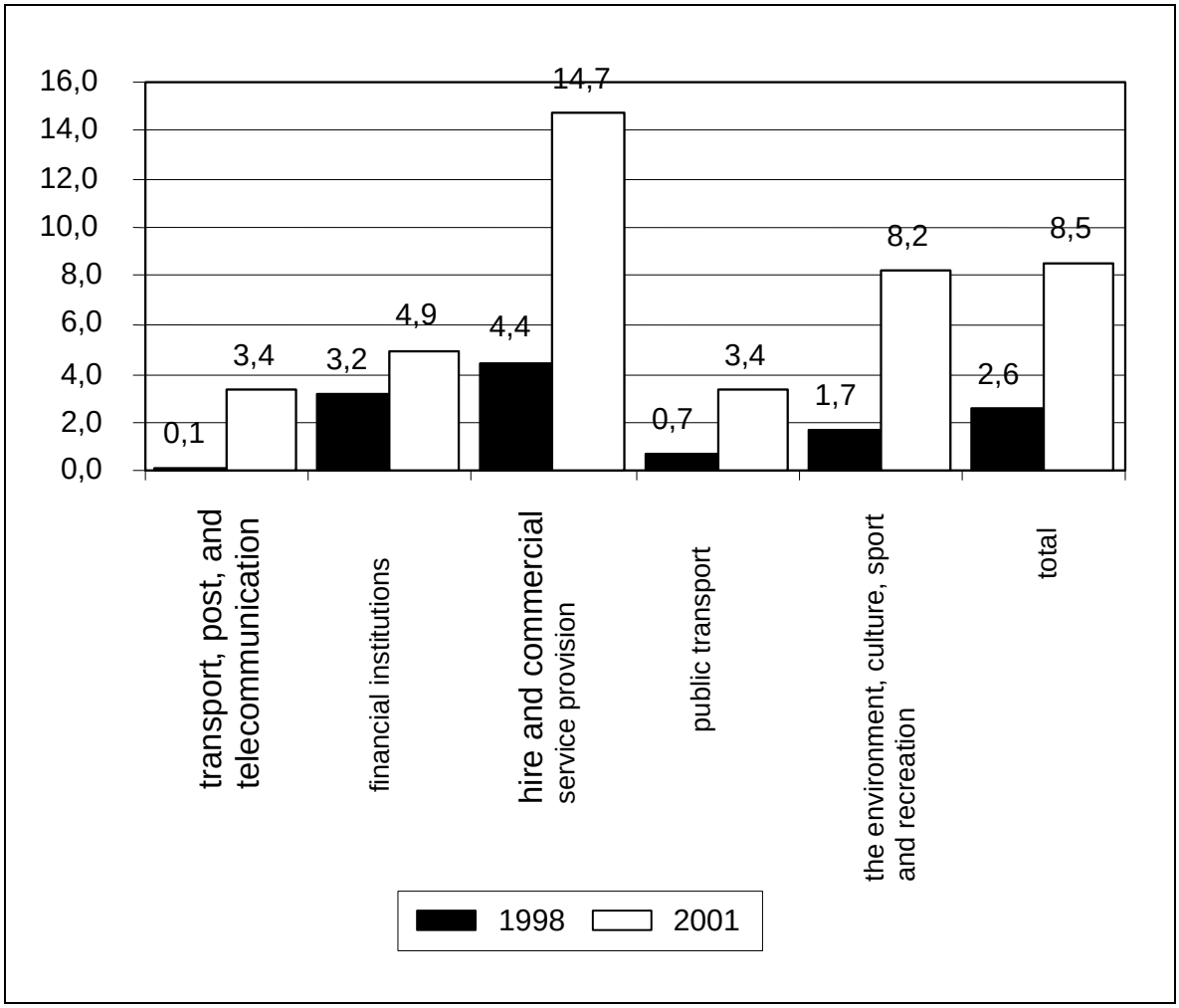
The information concerning the current number of teleworkers in the Netherlands is conflicting. The *Stichting Telewerk Forum* speaks of 600,000 teleworkers (10 to 14% of the working population). Teleworkers comprise 250,000 homeworkers and 350,000 mobile workers. Homeworkers are people who used to work the whole week at the office, but currently spend a minimum of one day per week working at home. Mobile workers are people who used to work 'on the road' and now organize their work activities for a substantial part of the time from home (such as service engineers) (Stec Groep, 2000: 56). In the middle of 1998 in the United States, 12.9% of the working population were teleworkers (European Commission, 1999).

Felstead & Jewson (1997) distinguish three categories of homework:

- work conducted at home (homeworker);
- work conducted from home (house as work base; compare the mobile worker);
- work conducted in the same grounds and buildings as the home (not in the house, but within the 'domestic living area'), such as a shopkeeper who lives over the shop.

We concentrate particularly on the first two categories, but the third category is also of importance in the evaluation of opportunities for a blending of functions in the residential environment.
Figure 3 gives a picture of the share of teleworkers per sector.

Figure 3 Share of teleworkers per sector, 1998 and 2001 (in %)



Source: Research voor Beleid [Research for Policy], 1999.

Certain sectors, such as hotels and restaurants, care and construction, do not lend themselves to teleworking. The share of teleworkers in commercial service provision is high. On the basis of E-business developments, The Stec Groep (2000: 53) expects in the long term an increase in the demand for residential space in an attractive residential environment. The Stec Groep does not specify this concept further. Such a residential environment can be found just as well in a big city as on a suburban or rural location. The distance between home and work is already increasing and in future it will become even greater. Thanks to E-business, the decision of where to live will be determined more than is now the case by the desire to live in an attractive residential environment than by the work location, according to the Stec Groep (2000: 53). The Stec Groep (2000: 55) is of the opinion that the number of teleworkers will grow strongly in future and as a result the South and East Netherlands will score higher as residential areas. Moving house will occur over larger distances which will often cross the boundaries of one's own housing market area.

Since E-business leads people to spend more time in their homes, the need for a spacious house is strengthened (for example, with one or two office or study rooms), as is the need for flexible lay-out, services (such as messaging services) and better telematics provision (such as ISDN) (Vlek, 1986; 1987; Stec Groep, 2000: 58). In short: the intelligent home is the future (Caso, 1991; Wilkström et al, 1998).
One increasingly hears it said that homes ought to be provided with a separate work space. A limited share of house seekers specifically want a living-working house (Louw, 1999). Ahrentzen (1989) gives indications for the design of a living-working house (see: Caso, 1991; Louw, 1999). Space and flexibility are the core themes.
Everything seems to indicate that Toffler's theory is now taking root in practical terms, even though the signalled changes are only at an early stage. The significance of the home is increasing, but for the community impact, the environmental impact, the economic impact, and the psychological impact it is clear, just as Toffler predicted, that much remains to be seen.

5. Working at home

It is clear that the home is not only the place for consumption and sleep, but work is done there too. In the traditional sense it is the housewife who works in the house: cleaning, washing, drying, cooking, sewing, ironing and bringing up children: unpaid activities which add value and as a result are productive. In modern families, in which the two income families predominate, these productive tasks are shared between the both partners, although the man's share usually still remains a modest one. The work function in the home can be seen more clearly if the household employs household help, paid cash in hand and often part-time, for their (usually her) activities (like cleaning and childcare).
The work functions which have been considered to this point are not new and have in general been provided for by the developer or the architect. But traditional house designs are only geared to these activities to a modest extent. However, everything points to the fact that it is no longer just these household activities that are concerned. The razor-sharp distinction between work time and free time is tearing us apart. The strict division leads to traffic-jams in the morning and at the end of the afternoon. It restricts the earning capacity of shopkeepers, proprietors of inns and restaurants and other service providers who have to close when their customers are free. No wonder that in the Netherlands the Shopping Hours Act is up for review and that working hours in offices and firms is becoming increasingly more flexible. According to some we are on the way to the 24 hour economy, but as a general picture of social life in the Netherlands that is somewhat exaggerated. Transport is becoming increasingly more difficult through the congestion, the prospect of pay as you drive and the unrelenting parking problems. At the same time the information technology revolution is developing at an enormous pace, generating more and more substitutions for actual transport. Thanks to the personal computer, the fax and the cellular phone we are always within reach, we can carry out our knowledge-intensive work wherever we wish and can put our contributions into the system anywhere. Our equipment is situated increasingly less often at a fixed place (machine, documentation, telephone), but is attached to the person instead (PC, cellular phone). As a result productive activities can be fragmented in time and space with in-

creasing ease. Employers are increasingly setting up their offices as buildings with flexible work places. The next step is for the employees to carry out their work for one or more days per week at workspaces set up in or near their homes (Vlek, 1986; 1987). Many cars are beginning to take on the form and function of a workspace. The same is true for hotels and airport lounges; only public transport does not accommodate the transformation very well until now.

For employers and employees, particularly in the commercial services, it is becoming increasingly more important for the home to be suitable for carrying out work in a workspace which in the eyes of the Labour Law Inspectorate satisfies the appropriate requirements. The question is, what are these requirements. A place for a computer? A modem? An Internet connection? An extra telephone connection? A fax? Space to sit down, to do word processing and search databases? Space to store records and files? And most of all: a quiet environment without noise hindrance and with reasonable privacy? That all sounds very reasonable, but the Dutch Building Decree has not yet reached that stage. Increasingly often we hear that the ground floor of a family house must not only have a living room and a kitchen, but also a separate work space. How many family houses can provide this facility? To what extent are efforts being made to meet this wish? What can the employee and possibly the employer afford for such provision at home which saves on commuting from home to work, and transfers computer and telephone costs from the business to the home?
And then there is probably a small, specific, but very interesting group which sets much higher demands on their houses in order to be able to work at home. In the Netherlands roughly 80% of beginning entrepreneurs start their businesses in their own homes. Think of Hewlett and Packard who set up their embryo high-tech business in a garage in Silicon Valley. And in the Netherlands, the Philips brothers, who did much the same. Think of the workshops, ateliers, practice space for the physiotherapist or speech therapist, a wine tasting business, a business administration bureau, an outside catering firm, or a repair business. And that takes no account of moonshine distilleries, hash cultivation, or XTC laboratories.
What would happen if we built more houses with attached garages on the VINEX locations, mentioned in section 1? Would that promote car mobility? The households which are currently established on a VINEX location have on average just over one car per household. And you don't think that the residents would use such a beautiful garage just for storing the car? A garage is a marvellous extra space which can be equipped as a workshop, as a recreation room, or for extra storage. Attics and (now less often) cellars can also have such a function. It is far from always the case that it is high-tech and other post-modern business activities which take place at home. Not infrequently it is still a matter of more traditional activities such as shelling shrimps, making lampshades, or sorting out second-hand clothes.
There are some home workers who set very specific demands on their work space. They can indicate with exact precision what requirements their atelier or practice space must meet. The question is rather whether these requirements will remain unchanged for a whole century. In the Netherlands a dwelling lasts on average for more than 110 years. We must therefore take into account the changing business requirements accompanying a changing range of trades and businesses. Requirements for flexibility and adaptation

must be to the fore in such cases. If the demand for workspaces at home is brought carefully into the picture there could be a certain proportion of houses suitable for working at home both on VINEX locations as in renewal districts. In Louw (1999) an overview is given of recently built and designed working at home houses.

6. The economic vitality of the city threatened

The argument above was put forward from the perspective of the dwelling, but we can also a build up an argument starting from the city viewpoint. Then the question which stands to the fore is: what is the situation with regard to the economic vitality of the city? Table 1 reveals how in the Netherlands as a whole employment is growing by 2.5% per year (1980 - 1995) and in the last five years (1990 - 1995) by as much as 2.7%. Urban employment has however stagnated. In 31 cities (G31) with a large urban renewal task, the growth rate was 1.4% per year in the period 1980 - 1995, while in the last five years (1990 - 1995) the growth rate fell to 0.9% per year.

Table 1 Development of urban employment in index figures and average annual growth rate in percentages, 1980 – 1995

	Index 1980-1995 (1980 = 100)	Annual rate of growth 1980-1995	Index 1990-1995 (1990 = 100)	Annual rate of growth 1990-1995
Total G 31	123	1.4	105	0.9
Rest of the Netherlands	166	3.4	122	4.1
Total for the Netherlands	145	2.5	114	2.7

Source: Central Bureau for Statistics (Priemus et al., 1998: I - 65).

Table 2 Sectoral distribution of employment in the cities in percentages of total employment in 1995

	Industry	Building	Business, hotels and restaurants	Traffic and communication	Financial and commercial services	Government and other services
Total G 31	12.8	4.0	17.3	7.2	22.3	35.3
Total for the Netherlands	18.2	6.2	19.7	6.6	16.7	32.6

Source: Central Bureau for Statistics (Priemus et al., 1998: I - 68).

Table 2 shows that urban employment (G 31) is characterized by a low share of industrial employment and a relatively high share of financial and commercial services.

Table 3 Growth of the Gross Regional Product (GRP) of the urbanized districts (1970 - 1995)

	City growth in GRP in % per annum (1970-95)	City Environs growth in GRP in % per annum (1970-95)	Urban district growth in GRP in % per annum (1970-95)
Cities G 27	2.0	3.7	2.8
Rest of the Netherlands	-	-	3.2
Total for the Netherlands	-	-	2.8

Source: Van der Vegt & Manshanden, 1996 : 31; Priemus et al, 1997 : 54.

In the period 1970 - 1995 the Gross National Product in the Netherlands grew by an average of 2.8% per year (see Table 3). This was also the rate of growth in the urbanized districts of 27 cities with a large urban renewal task (G 27). In the 27 cities the growth of the growth of the Gross Regional product in the city environs was much higher (3.7%) than the gross product of the cities themselves (2.0%).
The employment development in the central cities has lagged behind that of the surrounding region (Van der Vegt & Manshanden, 1996 : 60). If we consider the development of the Gross Regional Product and the development of employment, then we must conclude that the economy in cities in the Netherlands is not going well and that the central cities lag economically behind the surrounding regions. The urban development via VINEX locations and urban renewal must thus be directed not only to housing, but also to employment and business activity.
The spatial integration of home and work as a result of the growing role of ICT could reduce the economic backlog of central cities and could contribute to a better social equity between city and suburb.

7. Employment in the residential district

It is encouraging that increasingly more municipalities, housing associations and the business world can look at the developments sketched here straight in the eye. Perhaps images of their experiences of the classic urban renewal remain in their memories; then, pre-war districts were renovated for the sake of the public housing function at the cost of commercial activities and employment, which often disappeared with the demolition and renovation. Employment in the districts undergoing renovation must not suffer as a result, but should rather emerge as the victor, with the urban vitality and economy of the district receiving a substantial boost. Moreover, the differentiation and liveliness in the urban renewal districts and on VINEX locations would be well served with a far-going integration of commercial activity in individual houses and the residential area.
In this context one can think of small scale employment in the district which would not fit into a single house. A fitness centre, the back-office of an administration bureau, or the workshop of a housing association. Such facilities could be given a place in the

basement of an apartment building, so that the ground floor would immediately get a lively aura. One can also imagine facilities being constructed so that they are linked to a local shopping centre.
If the housing associations were to listen to their residents, they would be able to grasp the enormous demand for various residential services, welfare services and care arrangements, varying from the demand for household help, security firms, prepared meals to delivery services for medication, pizzas and other products, crèches and help with DIY. Meeting this demand fits on the one hand with the drive to maintain the legendary customer friendliness of the housing associations and can on the other hand contribute to a more differentiated and lively residential environment with facilities for business activity, employment and voluntary services.
Little is known as yet with respect to the background and the nature of the demand for workspaces in districts undergoing renovation and on VINEX locations. We may assume that the rapid rise of telematics in combination with the increasing congestion on the roads will strongly stimulate this demand. Everything points to us having to get hold of a lever which can help us to promote the economic vitality of the cities. For the development of VINEX locations and the restructuring of city districts that is an important prospect.

8. Looking at the tea leaves

If the ICT-revolution continues and if resources such as the telephone, PC and television become more individualized, increased individualization within the household is to be expected. There will be increasing pressure on the almost tautological equation: number of households = number of (inhabited) dwellings. The home is taking on more productive tasks: teleworking, telebanking, telelearning, teleshopping, and telemeetings. Some of these functions still fit into the domain of home consumption (such as telebanking and teleshopping), while others are associated primarily with the productive side of society (teleworking, telemeetings). The question still applies: Do people work at home, or do they live in the office? (Vlek, 1986: 41). Increasingly, both consumer and productive aspects will be recognized in a particular function (for example, telelearning). The home is being transformed into a centre of consumption and production. That is also increasingly the case for the car and public transport over a longer distance. On the one hand the consumer function of the home will lose ground to the production function, while on the other hand households, if they have the financial resources, will increasingly want to the have more residential locations at their disposal. The digital distinction between place of residence and place of work will lapse. The distinction between place of residence and holiday home will also become blurred. Households no longer just have a house from which they commute to some fixed workplace, but move increasingly often between a collective place of work (per household member), the conference centre (as quasi workplace), the home as home-workplace, and the second home/place of recreation where the work function is usually less strongly present. An increasing spatial fragmentation arises in the behaviour of households and individuals in which the demarcation between working hours and free time becomes more pluriform and diffuse. Physical mobility increases further, but the criss-cross movements will take the upper hand so that the travel peaks will be flattened out. The loss of time, the cost and the irri-

tation of sitting in a traffic jam forms in this dynamic a tremendous push factor; the increasing opportunities and internalization of ICT-applications by households and companies form the most important pull factor.
The spatial and temporal demarcation of living and working is becoming more pluriform and dynamic. The productive activities increase in and around the home, while companies direct their human resource management to the strengthening of the bond holding the personnel to the company through the introduction of consumer activities "in the time and at the expense of the boss": birthday celebrations, excursions, incentive journeys, survival expeditions, cultural events, fitness facilities.
For the home these developments imply: space, flexibility, good connections on ICT nets, the integration of legal conditions of employment requirements and functional residential requirements, the close availability of pluriform service and care arrangements, opportunities for differentiation in home and work activities, both individual and collective activities, ample facilities for the delivery of products (box or safe) and adequate parking accommodation for cars and bicycles. The interaction between residents, home, and urban services will increase spectacularly (Caso, 1991).
For the city these developments imply a much greater pressure on the multiple use of space inside buildings and at the level of district and neighbourhood, increasing employment opportunities in the district, differentiated services and facilities in district and neighbourhood, and hierarchical, finely branched infrastructures for ICT and physical traffic. Moreover, opportunities for outdoor recreation from the home must also be within easy reach, which suggests a network of water- and green structures in the city. This calls up a picture of a network city with a greater density around the traffic infrastructure and in particular the transfer points, and a lower density in the areas bordering on the water- and green structures. Sharper contrasts will be created in the cities, which in the Netherlands also include the growth centres and the VINEX-locations and which are being transformed from single core cities to multi core urbanized regions. This perspective has consequences not only for the development of new areas, but also particularly for the redevelopment and renewal of existing areas. Moreover, in this perspective there is a greater freedom of choice in place of business or residence (Vlek, 1987) and a reduction in the transaction costs when moving (costs for the solicitor, estate agent, stamp duty). If urban renewal, the restructuring of both residential and industrial areas is developed along these lines, then a glorious future awaits the network cities.

References

ABN AMRO, 1999, **Web of Winkel? E-commerce en retail in Nederland** [Web or Shop? E-commerce and the retail trade in the Netherlands], Amsterdam (ABN AMRO).

Ahrentzen, S., 1989, A place of peace, prospect and …. a PC: the home as office, **Journal of Architectural and Planning Research**, **6**, nr. 4: 271-288.

Booz, Allen & Hamilton, 2000, **The competitiveness of Europe's ICT Markets: The Crisis Amid the Growth**.

Caso, O., 1991, **Influence of telematics on the design of dwellings**, Delft (OSPA, TU Delft).

European Commission, 1999, **Status report on European Telework**. Telework 1999.

Felstead, A. & N. Jewson, 1997, Researching a Problematic Concept: Homeworkers in Britain, **Work, Employment & Society**, **11,** nr. 2: 327-346

Forrester Research, 2000, **European online retail will soar to 175 billion euros by 2005**, http://www.forrester.com

Louw, E., 1991**, Technologische megatrends en de geografische en temporele relatie wonen-werken** [Technological mega trends and the geographic and temporal relationship living-working], Utrecht (Programmacommissie Stedelijke Netwerken).

Louw, E., 1999, **Perspectief voor woon-werkwoningen. Een verkenning naar een nieuw woningtype** [Perspectives for living-work dwellings. A reconnaissance of a new housing type], OTBouwstenen 47, Delft (DUP).

Priemus, H., E. Kalle & R. Teule, 1997, **De stedelijke investeringsopgave: naar vitale, ongedeelde en duurzame steden in Nederland**, Delft (Delftse Universitaire Pers).

Priemus, H., R.C. Kloosterman, B.W. Lambregts, H.M. Kruythoff & J. den Draak, 1998, **De stedelijke investeringsopgave 1999 - 2010 gekwantificeerd. Naar economische vitaliteit, bereikbaarheid, sociale cohesie and duurzaamheid**, Delft (Delft Universitaire Pers).

Stec Groep, 2000, **De impact van E-business op de Nederlandse vastgoedmarkt** [The impact of E-business on the Netherlands real estate market], Nijmegen/Voorburg (Stec Groep/IVBN).

Toffler, A., 1980, **The third wave**, London (Pan Books).

Vance, J.E. 1966, Housing the worker: the employment as a force in urban structure, **Economic Geography, 42**: 294-325.

Vegt, C. van der & W.J.J. Manshanden, 1996, **Steden and stadsgewesten; economische ontwikkelingen 1970 - 2015**, The Hague (Sdu).

Vlek, R., 1986, **De toekomstige betekenis en gevolgen van tele-arbeid en tele-thuiswerk in Nederland** [The future significance and consequences of teleworking and tele homework in the Netherlands], Leiden.

Vlek, R., 1987, **Tele-arbeid en tele-thuiswerk** [Tele-work and tele-homework], The Hague (RPD).

Wilkström, T., K.P. Linden & W. Michelson, 1998, **Hub of Events or Splendid Isolation. The Home as a context for teleworking**, Stockholm (KFB, The Swedish Transport and Communications Research Board).