The City, the Elderly and Telematics

Design aspects of telematics applications in a residential neighbourhood
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O. Caso
For those who are no longer here
And for those who have not yet arrived
My interest in city-telecommunications relationships really began in 1988 during my final project at the Faculty of Architecture of the University of Naples "Federico II." At that time I discussed with my tutor Prof. Capobianco the possibility of introducing a library in a dense and downgraded zone of Naples lessening the physical constraints by adopting telematics applications. After my degree I had the opportunity to further develop my interest working at the IPIGET, a Research Institute at the National Research Council (CNR) of Italy under the guidance of Prof. Beguinot and Prof. Cardarelli. It was in this period that I got in touch with Prof. Drew at the Delft University of Technology, a contact that led to my first stay at the OSPA in Delft in 1990/91 also thanks to the friendly advice of Prof. Piero Rossi at the Faculty of Architecture of the University of Rome "La Sapienza." This experience was repeated in the following years and in 1994 the TU Delft gave me the occasion to begin a Ph.D. about the social and spatial aspects of telematics applications in residential areas.

Since I first came to the Netherlands to carry out my research tasks, telecommunications have taken a central place in my life for two main reasons: because of my interests as researcher in the potentialities of the new technologies, and because it was the medium through which I was able to keep in touch with my family and friends. I cannot tell which one of these two reasons was the most determinant for my work: surely they were mutually reinforcing factors. However, now that I am going to face new challenges all these exciting years come back to mind with their fascinating population of faces, words, situations and happenings. I would like to be able to express my thoughts about each one of them, although I know this is impossible to do.

Nevertheless, I want to take this opportunity to thank some among the many persons who helped me in pursuing this result. Paul Drew and Mart Tacken surely take a front seat in this concern. Without their supportive and educated trust I could have never reached this stage. Furthermore I owe to Paul the title of this book, and to Mart some parts of Chapter 6. Other colleagues at the Urban and Regional Planning Group of the Delft University of Technology also contributed in different ways: helping in the preparation and conduct of the case study in Zoetermeer, for instance, and as very valuable opponents during the table-tennis challenges at lunch time. Edward Hulsbergen’s comments were particularly useful to me especially for the understanding of the position of my work in relation to the landmarks of urban research. With the help of Fons van Reisen and Jan Meijdam I shaped many of the ideas contained in this thesis. I think they will recognise their contributions. Ana Maria Fernandez Maldonado, thanks for all what you have done for me and also for what you could not do. I am sure your Ph.D. thesis will be a great success. With Luisa Calabrese I have spent many evenings talking of memories and plans, while in the present time we are trying to join our efforts in a new project. I also like to mention here some helpful companions like Asaf, Karina, John, Marjolein and Ximo. The contacts I can keep with my great friend Annito Abate are mainly of virtual nature, because of the two-thousands kilometres of physical distance. Nevertheless, his contribution to this book has been decisive. Most of the figures in Chapter 9 are due to his ability with computer aided design. David Baynton helped by checking my use of English language while Anja Nerrings did not lose her patience laying out this book. Arlette Brouwers designed the cover, Mart Tacken translated the summary into Dutch. A particular thanks go to Jan Donner, who has known my family and me for more than twenty years now, and from whom I have learned most of what I know about the Netherlands and the Dutch habits. Thanks to Aernout and Marcia for your friendship, joyfulness and for some autumn beers we have had in cold November days.

Finally, I want to thank my father and my mother for their support and help in every moment of my life. As a father living away from his son I can now fully understand the emotions that my parents feel about having a son who lives so far away. My wife Antonella and my son Mattia Sabino shared with me the same high price: during two whole years we could only meet each other once in every two months. Notwithstanding this, I always received their full support. In particular Antonella knew very well the efforts and difficulties related to a Ph.D. project, having done one herself. Thanks to you all.

Olindo Caso
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D’autres Romes viendront, dont j’imagine mal le visage
... mais que j’aurai contribué a former.

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SAMENVATTING

237 LITERATURE
Introduction

D' autres Romes viendront, dont j' imagine mal le visage

At the end of his life the old Hadrianus looks back into the past. Many things have changed since he became Emperor. At that time he could foresee neither the political evolution that occurred, nor the changes in the socio-spatial structure of Rome, the Capital City. But he had a goal, a plan, and the tools to steer the processes of transformation. Now, older and wiser, he knows that this situation is an inherent characteristic of any future-oriented action.

Indeed, the future is basically unpredictable, and the actors in charge of socio-spatial transformations are particularly aware of this unpredictability. Like Hadrianus we need to set plans to reach goals, and we need to develop the appropriate tools to implement our plans. Nevertheless, to gain insight into possible futures is an indispensable operation for managers and designers. Not so much to predict the ‘face’ of future socio-spatial settings as for the definition of clearer objectives, for the correct formulation of plans, for the development of better and more efficacious tools.

Exploring the future is a risky exercise, which requires an approach that is conscious not only of possibilities and opportunities, but also of potential risks and dangers. This is especially important when we deal with the relationships between technological innovations and urban settings, as we do in this work. In particular, we have investigated the changing situation produced by progresses in telecommunications technologies. We asked ourselves whether these changes will physically impact on modern cities, and whether these impacts can be designed. This is clearly a future-oriented task for differing reasons. On the one hand, little information is already available on city-telecommunications relationships. Services and applications are not yet diffused enough to operate generalisations from current implementations. On the other hand, design is inherently a future-oriented activity.

Our goal is to contribute to a better insight for the use of designers into possible futures enabled by advances in telecommunications.

... mais que j'aurai contribué a former.

Therefore, this work does not aim to give shape to a more or less futuristic ‘Future City’, but to produce knowledge about design aspects of city-telecommunications relationships and give information on the possibilities and risks for socio-spatial settings of the introduction of telematics. Therefore we started from available information to give our contribution for a better, realistic future.

This work explores a specific research field in the area of city-telecommunications relationships: the design items associated with the introduction of telematics applications in residential areas. The goal is to deliver information and knowledge on these items to the main actors involved in the processes of transformation of socio-spatial settings, where urban designers are particularly in focus. More specifically, we will focus on the situation of a social group that could have much to gain from a correct introduction of telematics, but that is presently in danger of being excluded from the potential advantages of an ‘information society’: the elderly. The work is divided into two parts.

The first part includes Chapters 1 to 4 and aims to develop knowledge concerning the phenomena at issue. Chapter 1 sets the scene for the research. It includes the formulation of the problem statement as well as the
aims and the research questions. Current evolutions are also discussed. The second Chapter focuses on the contribution of telematics in the actual trends of re-organisation of urban functions and social communities. Observing the ‘city of people’ and the ‘city of services’ will give indications of the elements of change in contemporary socio-spatial contexts. Chapter three makes a systematic exploration of time-space aspects related to a telematics performance of activities (tele-activities). How people use the opportunities offered by telematics to access services and other people. The design aspects associated to tele-activities are dealt with in Chapter 4. Here, we consider the design aspects related to single tele-activities before proceeding to investigation of the aggregate aspects at differing territorial scales.

The second part of the work includes Chapters 5 to 10, and particularises the developed knowledge to a specific socio-spatial case. The fifth Chapter focuses on the social group of elderly people. We have discussed the main issues of an ageing society and explored possibilities and risks concerning the introduction of telematics applications. Chapter 6 reports the findings of a survey we conducted among elderly people living in the neighbourhood of Meerzicht, in the Dutch town of Zoetermeer. This survey was needed to understand the specific situation of the target group in a real socio-spatial context. On the basis of this information, in Chapter 7 we developed a design programme for an intervention in the neighbourhood in which telematics applications are introduced for the benefit of the elderly. This programme and the knowledge developed in the first part of the research path were tested in a design workshop. This is described in Chapter 8. Finally, in chapter 9 we formulated a design proposal for Meerzicht where we applied the knowledge produced on the design aspects of city-telecommunications relationships, with particular reference to the situation of elderly people. Chapter 10 summarises the answers to the research questions formulated in Chapter 1 and reports some overall conclusions and some directions for further research.

Notes

1. Marguerite Yourcenar. "Memoires d’Hadrien".
1.1 Towards an information society

The information society is in full swing. Giant networks of terrestrial and aerial infrastructures (cables and satellites) criss-cross the whole globe transporting any kind of information at speed approximating to ‘real time’. For whosoever is connected to the networks having access to them, interpersonal communication becomes independent from a distance for a large range of possibilities. Many initiatives are being undertaken to explore the possibilities offered by the information society and to study the impact of its progressive implementation. In Europe, the information society has been the focus of at least three specific RTD programmes under the European Union Fourth Framework Programme (1994-98): the Telematics Applications Programme, the Information Technology (IT) Programme, and the Advanced Communications Technologies and Services (ACTS) Programme. Together these three programmes accounted to 28% of the total budget of the fourth framework programme. The social relevance of information technologies is explicitly mentioned in the European approach to the information society. The green paper Living and working in the information society. People first (EC, 1996) of the European Commission aimed to open a debate on the information society in order to raise awareness of its social implications. These efforts are likely to continue also under the fifth framework programme (1998-2002) to be launched early in 1999, particularly within the Thematic Programme User-Friendly Information Society\(^1\).

However, the information society is in the first place a big business: it provides alternative ways for the marketing, the promotion, and the commercialisation of goods and services; for the monitoring of the preferences of potential clients, for a more efficient and less costly structure of organisations and companies. At the same time, the interest in its social and societal implications is justified by current evolutions. As the labour market changes, as communication between people via network connectivity becomes a resource for a better life, as new cultural environments emerge and which are related to cyberspace\(^2\), access to networks gradually becomes a basic necessity to hold a place in the society. The number of households owning a computer has sharply increased in recent years. In the Netherlands, available data shows that in 1996 43% of households owned a computer, while this was only 21% in 1990 (CBS, 1999). Instead, data on the number of Internet users is scarce since they are difficult to monitor\(^3\). The Netherlands counted about two million of subscribers to Internet by the end of 1998 in a population of about 15 million, and this number is expected to rapidly increase due to the introduction of free Internet subscriptions by telecommunications companies. Another idea of the dimension of the phenomenon can be obtained by looking at the sharp increase in the number of hosts\(^4\) reported in figure 1. Not surprisingly then, billions of dollars are being invested in ICT by governments and companies for the development of techniques and applications\(^5\).

Figure 1 The increasing number of hosts in recent years.

Source: adapted from SURF web page.

These developments have led many researchers to speculate on the destiny of cities in an age where virtual accessibility could acquire a comparable importance to what physical accessibility has meant to the industrial city. Many predict the end of the need for cities as we
know them, arguing that remote communication will be substituted for face-to-face interactions (a.o. Webber, 1964; Toffler, 1981; Pascal, 1987). If people can actually tele-commute, teleconference, tele-learn or tele-shop, the need for a structured organisation of physical space should sharply decrease. To others, improvements in telecommunications will just reinforce the centrality of cities as main suppliers of services (a.o. Castells, 1989; Gillespie 1992; Hall, 1992). In the Netherlands the relations between emerging technology and physical planning have claimed attention since the early '90s, particularly for concerning developments in telecommunications (Soekkha et al., 1990; Heerema & Witsen, 1990; Heide, 1990; Koning & Smidt, 1990).

Despite all the sensationalism that characterises the debate on the impact of ICT on our society, there is little doubt that socio-spatial settings are increasingly dependent upon tele-communications and information technologies. Cities are developing into a hybrid environment of virtual and physical communications, with telematics networks supporting a growing number of activities and applications (a.o. Castells, 1989; Jobse & Musterd, 1994; Hillman, 1993; Mitchell, 1995; Hond, 1995; Drew, 1996; Graham & Marvin, 1996; Castells, 1997). Besides a physical environment, with its materiality and constraints, people can now shape their own virtual environment, parallel to the physical one, which has its own rules, facilities and hindrances. They can choose when to make use of the one or to operate in the other. Physical and virtual environments have points of contact: cyberspace needs a physical place to be accessed, while the virtual space extends human capabilities beyond the traditional frontiers of time and space.

This process of hybridisation of socio-spatial settings poses questions and challenges that go back to the heart of the urban phenomenon, questioning the way in which cities are traditionally understood. For instance: how will the proliferation of telematics networks influence the social and cultural life of our cities? Will this innovation affect the physical structure of urban areas? How will the shift towards increasingly virtual communities influence the situation of different categories of persons – with special reference to the least favoured, such as the elderly or the disabled? What are the influences on the mobility behaviour of persons and transportation firms, and which consequences are possible for physical infrastructures? Is telematics a tool for a more sustainable environment? Finally, how will the city of the future look like as virtualisation takes command?

1.2 Some points to note

These questions have stimulated the actors involved in the processes of transformation of socio-spatial settings to investigate different themes of city-telecommunications relationships. Between others, three themes emerge that for various reasons deserve more attention:
— the design of the future hybrid space, because of the lack of available knowledge;
— qualities and structure of residential areas, because of their importance in everyone’s life;
— the situation of elderly people in this changing context, because of demographic trends.

1.2.1 Design

Designers, planners and urban managers are between the main actors of socio-spatial transformations. A large part of the responsibility for the shaping of the city of the future is delegated to them. In spite of its potential relevance for this concern, the spatial significance of telecommunications is still a very underdeveloped field in urban studies (Batty, 1990; Graham & Marvin, 1996), in sharp contrast with both great expectations and fears that often recur in the discussions about the quality of life in a space pervaded with telematics networks. Urban observers and social scientists provide most of the available knowledge of city-telecommunication relationships, and this knowledge is often necessarily contradictory. Consequently, designers, planners and urban managers suffer a knowledge gap when confronted with the task of designing the city of the future in the age of telematics, mainly due to the scarcity of reliable information on the significance of ICT for the design of future socio-spatial settings. The information produced by the urban observer and the social scientist can be an important input. Nevertheless it does not meet the needs of designers because it gives little information on the way to achieve a specific socio-spatial organisation in a specific context in relation to the changing situation produced by the rise and spreading of telematics networks. Indeed, there is a basic difference between the urban observer and the urban designer. The observer is mainly interested in the direction of urban
evolution to point out actors, factors, likeness, and contradictions of urban transformation. Design is more goal-oriented: it is a process to prefigure the future of a specific setting in relation to a given set of goals.

1.2.2 Residential areas
The situation of people in their residential environments takes a central place in the debate about the relevance of telematics applications for the design of future socio-spatial settings. As telematics makes the bridging of significant physical distances possible allowing people to remotely access services and facilities by network connectivity, it is possible that the residential area will acquire a different value in the daily behaviour of individuals (Reisen, 1997). Indeed many telematics applications can be performed in residential areas like tele-work, tele-shopping, or tele-banking. Technological developments already make possible the availability of some health-care and educational services in domestic environments, resulting in a potentially greater improvement of the possibility to access the functional system of cities. It is to be expected that the location of many activities will move from a larger territorial scale (region or urban area) to the smaller scale of the residential environment. These innovations will probably affect the relationships inside the dwelling, of dwellings with the outdoor environment and, on a larger scale, between neighbourhoods and urban areas. Traditional distinctions as public/private, personal/social, inside/outside, working/living, change their meaning as the boundaries between physical places and electronic spaces are increasingly blurred. Considering the enormous importance of residential areas for contemporary societies, these potential developments have also to be carefully investigated in relation to their social and societal value. Indeed, the greater part of our lives is spent in residential environments, where much of our personal, social, and cultural identities are formed.

1.2.3 Seniors
Not only possibilities, but also potential risks can be associated with the introduction of telematics applications in contemporary socio-spatial settings. In this respect, the situation is critical for the least favoured social categories, like the elderly or the disabled, or the less well off. For instance, the elderly may enjoy better servicing and assistance thanks to the improvements in the functional system rendered possible by telematics applications; but at the same time the homebound may also experience more isolation since they can be remotely assisted, thus having to pay for ‘progress’ a high social cost. At the same time, telematics applications can reduce the costs of services, becoming attractive to larger sections of the population. But, on the other hand, these advantages will be certainly enjoyed by the more affluent and better-educated groups, while many others are likely to be excluded by lack of skills or resources. Current evolution already shows signs of increasing socio-spatial polarisation in western cities, a trend that may be reinforced by the current modalities of telematics introduction, where the most affluent social groups are the preferred targets for ‘cherry picking’ by tele-communication companies (Castells, 1989; Graham & Marvin, 1996). As current demographic trends show that we are heading towards an ‘aging society’, the question arises of how to extend the potential benefits of the information society to elderly people. Indeed, they are still a weak link in the social chain and not yet an attractive market segment for tele-communications companies.

1.3 Aims and targets of the research
Designers can look at telematics innovations in two ways. As a supporting tool for their profession: remote communication to support the physical and conceptual action of designing (easy access to specific knowledge, remote co-operation). And, as a challenge to those factors to which most design programmes are targeted: the potential modifications that new communications tool may render possible in contemporary socio-spatial settings. This present work focuses on this second aspect. The central problem that we wish to address follows.

Current practice in urban and architectural design does not take into proper account possibilities and risks for the potential modification of socio-spatial settings in relation to the ongoing spreading of ICT. Potentialities and risks are more often spoken about than designed. The main reason for this lies in the scarcity of available knowledge for designers and urban planners, which is expressed in design terms.

Consequently, the main aim of this work is to produce information on city-telecommunications relationships
as a contribution to the knowledge gap that designers and planners experience when confronted with the relationships between physical places and virtual spaces. Within this broader task, we will deal more specifically with a two-fold goal:

- To identify a number of qualitative guidelines which can lead the designer throughout the design process at different scales. Major attention will be focused on the residential scale (the dwelling and the neighbourhood).
- To give insight into the role of applications of ICT for the improvement of the quality of life in old age, with some possible consequences for the design of residential areas.

In order to reach these goals, it is necessary to build a bridge between research and design by understanding those elements that are related to telematics innovation, which may become relevant for the design of future socio-spatial settings. To this end, six different, but interrelated statements can be placed at the basis of the research:

1. The focus must be placed on the application of telematics, not on techniques. For the designer applications are more relevant because they are at the interface between technology and society (Keller, 1995) implying for users the possibility of a different way to carry out activities and to reach goals in their daily lives.

2. Applications must be considered as the result of interrelated Political, Economic, Social, and Technological (PEST) developments (Moran, 1992). Technology is not an end in itself, but a tool which has been developed, introduced and used for reaching certain goals in a determined socio-economic and political context. Technology does not determine the direction of evolution although it can be an influential factor.

3. The direct physical impact of telematics is minimal, if compared to its indirect effects. The laying of cables and other infrastructures, or the size of the necessary basic equipment (usually a PC and a modem) has little spatial significance in comparison to the effects of the potential modification of people's and firm's behaviour.

4. Designers and urban planners do not have enough usable information on city-telecommunications relationships. This knowledge must be deduced from the empirical and theoretical work of others as urban observers and social scientists, and must be translated into design guidelines.

5. Furthermore, extra knowledge of city-telecommunications relationships can be built up by using research methods and tools that are more familiar to the designer. A design experiment on a real situation can help to test the acquired knowledge and to extract more information on the topic.

6. Current trends in the development of telematics applications and services put at the centre of the debate the problems of the accessibility of these services for less advantaged categories of persons like the elderly. Design can contribute in answering these problems.

Keeping in mind these statements, the above mentioned goals can be reached by answering a number of research questions, namely:

1. What are the most relevant social and cultural aspects of the introduction of telematics applications in contemporary socio-spatial settings?

Designers often underestimate the social and societal relevance of ICT. It will be helpful to research in more detail the different social and societal aspects raised by the introduction of telematics applications and to look at their possible consequences in terms of changing demand for urban qualities.

2. How will the functional system of the modern city change under the pressure of possibilities offered by ICT?

Telematics applications are leading towards a deep reorganisation of the functional system in contemporary socio-spatial settings. This has implications for the way services are delivered to and/or accessed by users, and opens up a range of new possibilities for their locations with many aspects that are relevant at the design stage.

3. What are the most significant time-space consequences of the use of telematics applications by people and public and private institutions?

Telematics applications change the value of time and space. As these dimensions are basic to urban
settlements, it will be important to investigate the changes and to establish connections with the scale of the design.

4 What are the main implications for the design of socio-spatial settings due to the changing social and functional environments of cities following the introduction of telematics?

After having investigated the single design aspects related to the changing functional and social environments in consequence of the introduction of telematics, it is necessary to make look at the aggregate meaning of these aspects at different design scales. Different levels will be taken into consideration.

5 Which telematics applications can play a significant role in improving the quality of life in old age, and what are the associated risks?

Assuming a non-deterministic perspective, possibilities and risks related to the introduction of telematics applications for the third age will be investigated in order to detect those elements that can lead to an improvement of the quality of life of the elderly.

6 Which design aspects will gain importance in relation to the introduction of telematics applications for the benefit of seniors?

An important aspect for a correct introduction of telematics applications for the benefit of the elderly is the design of the living environment for the older individual, in which the position of facilities is determined in relation to functional and social items.

7 What is a possible design for a residential neighbourhood of the Network City?

Designing is the preferred investigation method of designers. Applying the knowledge produced to the design of a real socio-spatial setting will permit obtaining more information on the design significance of telematics applications for the third age. Also, it will be clear which aspects are related to specific cases and which other aspects have a more general value.

The questions addressed in this research can deliver information that is relevant to the many parties involved for differing reasons on the topic of city-telecommunications relationships. Designers will learn more about different possibilities for introducing telematics applications in socio-spatial settings and about the related architectural themes. Developers will receive information on the kind of services and facilities that can be introduced in residential areas also with the help of ICT, and on their position. A better insight into possible future developments and the role of telematics will help urban managers to set up better strategies for their cities. Telematics applications modify the way of accessing services by users. This kind of information can be relevant for providers of services, especially as the focus is on an expanding market such as the one formed by the elderly. Similarly, producers of computer hardware and software will be interested in specific demands from the older users. Finally, the users of these systems, and particularly the elderly, will learn more about possibilities and risks of ICT for their situations.

It will be convenient to start from the very beginning by taking a brief look at the relationship between scientific principles and technological innovation and at the main features of telematics.

1.4 From scientific principles to technological innovation

According to Thomas Kuhn (1971), science evolves cyclically by means of changing paradigms. Similarly technology alternates between periods of normality and revolution, the latter being determined by the emergence of what Milan Zeleny (1987) calls “superior technologies”. The revolutionary effects of superior technologies are evident through the impact they have on existing supporting networks: say, the whole complex of situation, rules, facilities, organisational factors, as well as other situations for which a specific technology can be used (Zeleny, 1987).

According to Zeleny any technology is defined by the convergence of three factors: hardware, software, brainware: with a fourth one: the supporting network. Hardware, software, and brainware respectively describe the physical structure of the technology, the way to use it, and the motivation for its use. The supporting network refers to the environment that renders possible the application of that technology. For instance a car (a
technology perfectly defined in its hardware, software, and brainware) is useless in a context where no streets, gas stations, or spare parts exist. The example of the car is also helpful to explain the revolutionary effects of a superior technology on the supporting network. At the dawn of its introduction, the existing network of streets and facilities, as well as the mobility behaviour of people was completely different from the one we know nowadays. It was targeted on other transportation means, like horses and, more recently, the train. The introduction of the car gradually implied a deep re-organisation and adaptation of the physical environment. New streets were built with different characteristics from the previous ones, new kinds of works saw the light, a different understanding of the city arose partly as a consequence of the increased capacity of mobility of individuals in time and space.

Zeleny observes that technology displays an evolutionary character. A superior technology intervenes in an existing supporting network created in relation to a previous technology. As time goes by, the technology, once superior, is absorbed within the context in which it is applied and developed until it expresses all its potentialities. At this point a new technology may arise with a character of superiority in respect to the existing context, in a continuing cycle (fig.2).

In this context, the relation between scientific principles and technological innovation is evident: technology arises as an application of scientific principles to products and processes for a given scope. This process may take place in two ways: through vertical and horizontal transfers (Brooks, 1966, quoted by Jantsch, 1972). Vertical technology transfer signifies the movement from a scientific principle over elementary new technology to new technological products, processes, systems, etc. Horizontal technology transfer signifies the diffusion and application at a given level of the vertical transfer process, in particular the diffusion of technology and its application to new ends as well as the creation of new services (Jantsch, 1972). In this view, the emergence of superior technologies seems to be a matter of vertical transfers, while the consequent modification of the supporting network can be seen in relation to horizontal transfers.

1.5 Telematics

Telematics has been defined as: "those applications of computer techniques and information engineering for which the bridging of significant physical-and any related organisational and cultural-distances by network connectivity is an essential feature" (Arnabak, 1990), where the term is derived from the French télématique, coined by Nora & Minc (1978).

Telematics is a superior technology produced by the convergence of telecommunications and information technologies that renders possible real time remote data communication in the form of text, video and voice. It finds applications in many activities in which exchange of information is concerned. The supporting network of telematics includes a broad range of situations and possibilities, from the organisation and the performing of work activities to the management of traffic and transportation, from leisure time activities to many other services for the individual or the society. As we look at figures 3 and 4 – both borrowed from Graham & Marvin (1996) – we see the merging of different
Figure 3
Different technologies merging into telematics
Source: adapted from Graham & Marvin (1996)

Telecommunications
Analogue and electromechanical.
Telegraphy, telex and Plain Old Telephone Service (POTS).
Poor data and facsimile.
National monopolies (usually public).

Computing
Large, clumsy, expensive and centralised mainframes. Used for administration and finance.

Digitalisation and technological convergence

Media technologies
Radio and TV broadcasting: Analogue signals. Limited bandwidth, national monopolies.

Figure 4
Expanding range of telecommunications services.
Source: Graham & Marvin (1996)

Telecommunications
- Computerised exchanges
- Digital data, voice, image, video and sound transmission (e.g. ISDN)
- High capacity transmission lines (optical fibre and satellite)
- Increasing wireless and mobile infrastructure
- Growing intelligence of networks through software innovations

Computing
- Cheap, microcomputing equipment distributed in most workplaces and many homes
- Plummeting costs, burgeoning capability
- Growing focus on computer communications (electronic mail, on-line databases, electronic data interchange, videoconferencing, multimedia)
- Growth of Value Added Network Services (VANS)

Media technologies
- Digital transmission, computerised storage and manipulation
- Satellite and cable networks available
- Global media marketplaces developing
- Shift from broadcasting to 'narrowcasting'
- CD ROMs, on-line interactive services and multimedia developing fast
technologies into telematics (fig.3) and the expanding range of telecommunication services until the year 2000 (fig.4). The impression is that the so-called telematics revolution is now nearly complete. The vertical technology transfer has operated; current developments are focusing on the technological horizontal transfer in the form of integration of systems into a single environment of total communication and the development of new services.

Also new surprising applications such as the faber can be seen as the result of horizontal transfers. The faber (from fabricator) is a new application of ICT by which it is possible to remotely recreate an object. Basically it is an application that extends the CAM technology: a laser "reads" the form of a specific object and sends this information to a remote computer which instructs a second laser to recreate the same object by assembling plastic particles. With this technology objects can be "faxed" as well, potentially with far-reaching consequences in many sectors such as the design of goods, their production and delivery. Yet, this is still horizontal transfer. A vertical transfer in this field would mean for instance to invent a new material to enlarge the range of application of the technology.

This horizontal process is particularly important to us because it creates the conditions for which telematics as superior technology consolidates itself and allows a new support network to arise. This process is still far from completion, yet the emergence of new patterns of working, studying, shopping, and other activities again reveal the arising of absolutely new socio-spatial situations which are already affecting the structure of western city at different levels.

1.6 Possible, probable and desirable futures

Although in the sense of horizontal transfers, the study of city-telecommunications relationships can be still considered as future-oriented since applications of telecommunications have not yet realised their full potential. The most applications are still in an introductory or exploratory phase, notwithstanding that, they begin to be widespread also thanks to the rise of world-wide networks such as the Internet. The next 10 years will be of crucial importance for the understanding of the effects of telematics innovations on socio-spatial settings. At the present time we have no tools available to define with enough precision future evolution. In the meantime our task is to try to look into the future in order to distinguish perspectives in which current developments can be introduced. This attempt aims to recognise the relevance of changes and to assess their meaning for socio-spatial settings in order to better manage present uncertainties (Drewe, 1996). Indeed contemporary scientific culture still considers uncertainty as an evil, a black hole in which knowledge looses its reference points. Instead, in many cases uncertainty has a positive value that should be maintained in order to permit future generations to meet their desired futures by preserving their ability to choose from more options. The real problem is not to reduce uncertainties, but to manage uncertainties. To this end, Drewe (1996) recognises several ways:

— further research (as far as processes or operating environments are concerned);
— clearer objectives (especially in the case of conflicting interests);
— more or different means (in order to achieve the objectives);
— a more co-ordinated approach (if different parties and decision-makers are involved).

Probably two more ways to manage uncertainties could be added to this list:

— monitoring evolution in relation to a given set of goals (in order to suddenly detect changes of direction, new facts, or impending problems);
— switching to a more design-oriented approach when lack of knowledge does not allow the prediction of the future.

A way of managing uncertainties makes a distinction between three different futures: desirable, probable, and possible (Jong, 1992). This distinction reflects the three fundamental categories with which we relate to the future. Respectively: what we would like it to be; what we know it will be; what it can be. The relationship between these three futures is reported in figure 5. Only some of the possible futures are also probable, which is the domain of predictions. At the same time probable futures are not always desirable: this is the domain of politics. Those possible futures that cannot be predicted must be designed.
A comment is required about the evolutionary character of the scheme in figure 5. What is not desirable, probable, or possible at the present moment may become desirable, probable, or possible in the future due to evolution in socio-economic and technical domains. Design as an investigating methodology could be very relevant in this concern, since it may help to explore the frontiers of the possible.

1.6.1 Desirable futures
Desirable futures refer to what people consider the best developments for themselves and the environment in which they live. They are the goals that people want to reach and for which a set of initiatives must be undertaken. Therefore, desirable futures are a matter of politics in the sense that goals must be identified, choices and tools have to be discussed and agreed, and an equilibrium between the different interests of individuals and groups must be found.

But, how desirable is a future with telematics? The debate around this subject has seen a great deal of both utopian and dystopian visions, which are inherent in any technology. Indeed, to speak in Zeleny's terms, the desirability of the effects of a technology on a socio-spatial setting is a matter of how the brainware of that technology is interpreted. The well-known dialogue in Plato's *Phaedrus* between King Thamus and Theut, the God of inventions, concerning the invention of writing, shows how contrasting interpretations can be given regarding the effects of a technology. For instance, the same arguments used by Plato served an article published in the scientific section of the Volkskrant to describe the doubts about the influences of telematics on learning: “who can find any kind of information in a split second, has less necessity of prepared knowledge. Some scientists argue that this will render people less intelligent. Others recognise the rise of new abilities that are more information society related” (Jole, 1996)\(^7\). It is easy to comment on how these arguments could lead to endless discussions whose real usefulness is to contribute to raise awareness of possibilities and risks concerning a certain technology. A more helpful way to discuss the desirability of a future with telematics is to look at its potential relevance in relation to a set of goals.

Indeed, telematics is a technology, thus a tool and not a goal per se. Consequently goals have to be formulated which can be reached by the application of telematics; at the same time the relevance of telematics in relation to the goals has to be spelled out. In the field of spatial planning, the expectations regarding telematics cover different areas: traffic congestion and related pollution; better servicing of less favoured categories of people; development of rural and isolated areas.

For instance, the Dutch government is promoting national plans to facilitate the introduction of telematics applications. The Ministry of Transportation (V&W, 1998) has developed a policy in which telematics is explicitly mentioned as a tool to reduce traffic congestion at peak hours that fits into the more general goal of a sustainable society. These expectations are based on the possibility of substituting activities such as working, shopping, or learning by tele-commuting, and to render traffic control more efficient by means of better information and intelligent guidance systems.

1.6.2 Probable futures
The probability of a certain future is a matter of prediction, which in turn depends upon the knowledge we have already built up about the phenomenon at issue or on comparable phenomena, which permitted the construction of a theory. It is, therefore, a job for the scientist who on the basis of existing theories and observing current tendencies can assess with a certain precision how probable a given future is. Nevertheless, even in these cases predictions should be handled with care: the history of human evolution is full of wrong predictions.

The absence of verified theories on telematics and the city renders it difficult to foresee the future. This problem has led many researchers to try to establish analogies with the effects and the patterns of diffusion of the telephone. But, the enormous difference in the
range of services covered renders this comparison rather problematic. Apart from this, this parallel could only serve to discover eventual similarities in patterns of technological penetration, leaving unanswered the question regarding the impact of telecommunications on the urban space. To us, this is a fundamental question.

Another system commonly used refers to the development of scenarios. In the Swiss Project Manto three different scenarios were developed according to the level of technological penetration: total information society; divided information society; technological scepticism (Rotach & Keller, 1987; Rotach, 1988). Ian Miles (1995) prefers to start with spatial scenarios instead of technological ones. If the focus is on the residential environment he suggests identifying scenarios for the home within the context of social, political, environmental, and technological trends. This is necessary because “the diffusion of new products and processes, the ways they are used and the implication of this for working and living patterns are much more difficult to forecast [than underlying technical potentialities of technological trends]” (Miles, 1995). These kinds of predictions, however, can only serve to develop alternative visions of possible futures. They cannot ensure the probability of any future by themselves. Ironically, Drewé (1996) argues that the most efficacious predictions probably lay in the billions of dollars that large multinationals such as IBM, AT&T, Philips, Siemens, Microsoft, and almost all Telecom companies are investing in telematics applications.

1.6.3 Possible futures
Instead, possible futures are the domain of design. In this domain different futures can be sketched as having reference to the conditions for which they are technically, economically, and socially possible (Jong, 1992) -see figure 5. The investigation of possible futures is often related to the desired futures, since design is a goal-oriented activity. Examples of possible futures are the “city of bits” (Mitchell, 1995) and the “cabled city” (Beguinot, ed., 1989).

Mitchell defines the city of bits as “a city unrooted at any definite spot on the surface of the earth, shaped by
1. Setting the Scene

connectivity and bandwidth constraints rather than accessibility and land values, largely asynchronous in its operation, and inhabited by disembodied and fragmented subjects who exist as collections of aliases and agents. Its places will be constructed virtually by software instead of physically from stones and timbers, and they will be connected by logical linkages rather than by doors, passageways, and streets" (Mitchell, 1995). Mitchell observes the emergence of phenomena of 'recombinant architecture' for which the introduction of telematics in the traditional building types gives rise to a generation of architectural mutants like electronic shopping malls, 'bitstores', virtual museums, etc.

The 'cabled city' (Beukenot, ed., 1989) moves from the disappearing of constraints of physical propinquity between functions and on the possibility of eliminating forced mobility. In the design proposed for Naples (fig.6), the potential of telematics is used to contrast the problems deriving from the extreme congestion of the urban area. To this end, a re-organisation of all urban functions by telematics is proposed. This re-organisation should have the potential to facilitate the re-use of the existing urban fabric and historical buildings due to the diminishing relevance of physical constraints. This approach is logically opposed to the traditional 'adding policy' that has produced the uncontrolled growth of our cities.

1.7 From innovation to design: the methodological problem

Looking at the future by design essentially means to consider the domain of possible futures, particularly those futures that cannot be predicted on the basis of current knowledge.

This operation needs the development of specific design knowledge of the phenomena at issue. The building of a bridge between available knowledge on city-telecommunications relationships and information needed by designers - thus between research and design - is the central methodological problem in this study. We have addressed this problem by considering different perspectives of the study of city-telecommunications relationships. According to Graham & Marvin (1996) four perspectives can be identified. Figure 7 refers.

![Figure 7: City-telecommunications relationships. Competing perspectives. Source: adapted from Graham & Marvin (1996)](image)

- Technological determinism. Technology determines the direction of urban evolutions.
- Utopianism-futurism. Technology is the solution to social, economic, spatial, and physical urban problems.
- Dystopian/urban political economy. Technology is shaped by dominant political and economic classes for their own benefits, and this leads to uneven socio-spatial developments.
- Social and political construction of technology (SCOT - PEST). Technology is shaped within society to reach specific goals. The applications have both potentialities and risks for urban developments.

We think that the task of investigating the design significance of telematics applications for future socio-spatial settings can be only fulfilled within the SCOT - PEST approach. It is a matter of considering which futures are made technically, economically and socially possible by the introduction of ICT and to consider the possible negative consequences as well. Keeping in mind the basic statements defined in a previous section, we propose to realise this by adopting a schematic path...
leading from possible futures to design passing through three essential components of the built environment: functional, social, physical. This scheme is derived by the Electronic Home Study Model of Moran (1992), and by the approach we already quoted from previous publications (Caso, 1991; Caso & Tacken, 1993). The scheme outlined in figure 8 aims to represent the relationships between the elements linking innovation to design.

Inter-related political, economic, social and technological (PEST) factors tend toward the development of new applications of telematics. On the basis of current state of the art and the direction of R&D activity, a number of telematics applications can be considered. The introduction of such applications has effects on both internal and external organisation of services; the way in which they function and the way in which they are rendered accessible to users: this is the functional component of the built environment. Similarly, telematics applications may also stimulate new patterns of social interaction: this is the social component. Reciprocal influences exist between these two components: the functional environment conditions to a high degree the behaviour of individuals; while social structures are in turn the target of functional organisation. Both functional and social components potentially reflect themselves in the structure and form of the three territorial levels of the built environment—the home-settlement system (Moran, 1992): this is the physical component. On the other hand, the physical environment produces feedback that influences the other two components. The feedback (shown by dashed lines in figure 8) can be regarded as processes of reciprocal adaptation. In an early stage of telematics introduction, the new possibilities offered by this technology will be probably arranged within the existing physical structure with minor adjustments. At a later stage it is possible that the need to fully enjoy the potentialities of telematics applications will demand a more consistent re-design of the physical environment.

The inter-relations at different scales between these factors originate problems, and raise questions and needs to be matched to the field of design. Since designers are mainly concerned with the physical environment, it is from here that the proper design process usually begins. How this process further develops, including ex ante evaluation and post-occupancy evaluation and monitoring, is not an issue here.

This path will lead us through the following chapters of this work. In particular, we shall review and analyse available knowledge in the area of city-telecommunication relationships following the logical sequence of operations summarised in the scheme in figure 8. The first step will be the study of available literature on the relationships between telematics innovation and the structure of social and functional urban environments to try to point out the direction of changes (re-organisation). The relationships between this level of re-organisation and the physical component of the urban environment will be defined with the aim of informing a repertory of design relationships representing an ordered knowledge for designers to be
interpreted according to the situation. At the end of the path we will have conducted an exploration of the city-telecommunications research area through the eyes of the designer. This operation (which has been not yet attempted in a systematic way) will lead to more complete and organised knowledge than presently available. The knowledge will be made explicit and will, therefore, become accessible to designers for the range of possible applications. This result represents per se a production of new knowledge in the area. Other knowledge will be produced by operating a specification through the application of knowledge in a real socio-spatial context (a case-study). We shall focus on the social group: elderly people and observe their situation in a residential area in the Netherlands. Following the SCOT-PEST approach described earlier, we shall see which are the positive and negative potentialities for telematics applications in relation to the existing situation and to the desired developments. Finally, our observation will be synthesised in a design project for the chosen area. Before proceeding along the described path, however, we need to define a number of points to set the scene of the investigation more clearly. In particular, we need first to approach the challenge of telecommunications to the basic dimensions of human activities: time and space. Then, we need to define the spatial reference for our investigation, that is, the spatial organisation in which the changes take place, and the challenges that designers are going to face. The rest of this chapter will be devoted to this task.

1.8 Changing meaning of time and space

The reasons for the growing interest of urban observers in city-telecommunications relationships essentially derive from the potential of telecommunications to adjust time and space barriers, which are the basic dimensions of human life. To a certain extent, applications of telematics render possible the transmission of information independently from spatial constraints and in 'real' time. This potential modification of time and space constraints will be one of the factors to be taken into consideration as we approach the future city. Urban observers are currently working to build a body of knowledge to understand and study the relevance of the changes, seeing them 'revolutionary' or, more likely, 'evolutionary' (Gottmann, 1983).

The capacity to transcend time and space barriers was already implicit in the plain old telephone service: therefore, under this point of view telematics do not bring about absolute novelties. But, the improvement in performance due to technological progress and the wider domains of application render these time-space features more effective and potentially able to help the developing of alternative socio-spatial structures. Furthermore, de-regulation has contributed to the rise of a more segmented and competitive telecommunications market, which has acquired a very different social and functional significance for contemporary urban societies. Introduction of telematics applications implies the possibility for individuals and companies to interpret time and space in different ways, and forces researchers to investigate the relevance of these changes for socio-spatial settings.

Indeed, time and space are basic dimensions in understanding spatial organisations as far as this implies the understanding of activity patterns. People's behaviour can be described by situating activity patterns in time and space. Individuals can be conceptualised as on a path through space within a time frame: no one can be in two places at the same time, and everybody has only twenty four hours a day.

In this view, time can be described in two ways: on the one hand time defines activities as taking place at a specific point in time; on the other hand time defines the amount of time, (the time budget), that is available for each activity. The same parallel holds for the space dimension: each activity occurs at a specific location, which on the other hand is defined by distance from other locations. The Swedish geographer Torsten Hägerstrand (1970) has introduced the use of time geography to understand spatial organisation. According to Hägerstrand, the daily path of individuals is governed by three groups of constraints:

— Capability constraints are those which limit the activity of the individual because of his biological construction and/or the tools he can command.

— Coupling constraints define where, when, and for how long, the individual has to join other individuals, tools and materials to produce, consume, transact.

— Authority constraints refer to a domain defined as a
time-space entity within which things and events are under the control of a given individual or a given group.

Several premises underline this method, as summarised by Michelson (1987): 1) people cannot be in two places at once; 2) it is difficult to do more than one major activity at a time; 3) each task takes time that cannot be devoted to another and that therefore delays subsequent activities; 4) the number of activities possible in one place is limited, requiring movement; 5) movements between points in space takes time; 6) one can only go so far in the day, and hence activities are limited also by space.

Telematics applications loosen this regime of constraints, and radically challenge the commonly understood notion of time and space as external environments within which cities and social structures develop (Graham and Marvin, 1996). This conception considers time and space rather as a simple container for social and urban life, and renders it very difficult to understand the potential relevance of telematics applications for people. “Most of the difficulties we have in understanding science and technology proceeds from our belief that space and time exist independently as an unshakable frame of reference inside which events and place would occur. This belief makes it impossible to understand how different spaces and different times may be produced inside the networks built to mobilise, cumulate and re-combine the world” (Latour, 1987; quoted in Graham and Marvin, 1996). Telematics, in particular, can produce these different spaces and times, sometimes in opposition to the physical ones and sometimes just parallel and alternative to them, but always determined and customised by individual choices. With telematics time and space give rise to mutual inter-actions able to produce a variety of situations for people’s behaviour that are different from the traditional ‘space oriented’ approach. Indeed, the traditional function of the city was to overcome time with space. Concentration of buildings, services, amenities served to guarantee the accessibility of places in a reasonable time. The function of telematics is to overcome space with time. By minimising time constraints, telecommunications render it possible to overcome space constraints. As we see, this is a reverse approach as already remarked by Virilio (1993). The materiality of physical cities is now challenged and undermined by an uncountable number of invisible ‘openings’ produced by the access to virtual domains. In these openings time and space combine each other conjuring up to form an infinity of situations that are difficult to capture within fixed frameworks. From external, objective dimensions, time and space become crucial elements in the conception of urban and social structures. Increasingly, it is their subjective interpretation, which give shape to socio-spatial settings. Telematics applications loosen Hägerstrand’s regime of constraints and render them less determinant for the pursuing of a desired behaviour by individuals and associations. These time-space collapsing properties render telematics a communication tool that is particularly suited to establish connections between different spatial scales.

1.9 Towards a subjective urban environment

To understand the nature of the changes currently happening in contemporary socio-spatial settings, it is helpful to refer briefly to the cultural milieu in the background of these transformations. Current urban evolutions are taking place within a broader technological and economic change supporting the shift from a ‘modern’ or ‘industrial’ model of development towards new models whose architectures and meanings are still vaguely understood. This transition from a society whose economy was primarily oriented towards the manufacturing and commercialisation of goods to a society dominated by information- and communication-based economies involves a deep re-organisation of urban cultures.

During the various phases of the industrial revolution, technological developments supported the shift towards modernity in society, “towards a forward-looking, technological and urbanised culture that allowed forms of temporal and spatial experience which were impossible in ‘pre-modern’ times. With modernism, technological development was equated with progress; there was confidence that single conceptual frameworks could explain all social phenomena; and planned action was seen as the route towards the emancipation of all social groups” (Graham & Marvin, 1996). This cultural scene is actually being transcended by the emergence of new cultural paradigms supported by advances in
information and communication technologies that influence the processes of the re-structuring of capitalistic societies. The new scene is often labelled with the term 'post-modernity', and this already gives a clear idea of the difficulties of interpreting the changes in action. Indeed the use of this term has engendered much discussion and disagreement about the cultural phenomena it tries to point out since it just indicates the supposed overcoming of the previous paradigm - 'modernity'. As modernity has assumed a specific meaning, as mentioned above, the meaning of post-modernity is still uncertain. Indeed post-modernity has been used as a 'container' for many diverse cultural instances that are arising within western societies.

The debate around post-modernity is wide, interdisciplinary, controversial, and complex. However, it is possible to identify some general key attributes that can be relevant for the purposes of this work. Our aim is to show how the shift away from modernity towards post-modernity goes hand in hand with a cultural change that recognises the value and richness of multiplicity and diversity in opposition to singularity. David Harvey (1985; 1989) expressed this character quite well as he synthesised the shift from 'fordist modernity' to 'flexible post-modernity' by means of a comparative table interpreting opposite tendencies in a capitalistic society (see fig.9).

In contrast with the objective reality of the modern society, which was defined from only one perspective at a time, the post-modern objective reality seems to be interpreted more as a multi-perspective and environmental dimension (Lowe, 1982). Single conceptual frameworks cannot explain social phenomena: everything becomes more complex, subtle, and inter-connected. As modernity implied similarity, uniqueness, one possibility, single place, and zoning, post-modernity implies difference, multiplicity, many possibilities, multiple places, and networking. Urban space is no longer considered as a simple reflection of society, but rather as an inherent part of it (Soja, 1989). Space constitutes society, as social and spatial structures are clearly interdependent. Rather than an objective environment of action existing outside of society, the meaning of the city is continuously being re-made by interactions between space, symbols and social power.

**ForIdSt modernity**  
- economies of scale / master code / hierarchy  
- homogeneity / detail division of labour  
- paranoia / alienation / symptom  
- public housing / monopoly capital  
- purpose / design / mastery / determinacy  
- production capital / universalism  
- state power / trade unions  
- state welfare / metropolis  
- ethics / money commodity  
- God the Father / materiality  
- production / originality / authority  
- blue collar / avant-gardism  
- interest group politics / semantics  
- centralisation / totalization  
- synthesis / collective bargaining  
- operational management / master code  
- phallic / single task / origin  
- metatheory / narrative / depth  
- mass production / class politics  
- technical-scientific rationality  
- utopia / redemptive art / concentration  
- specialised work / collective consumption  
- function / representation / signified  
- industry / protestant work ethic  
- mechanical reproduction  
- becoming / epistemology / regulation  
- urban renewal / relative space  
- state interventionism / industrialization  
- internationalism / permanence / time

**Flexible postmodernItY**  
- economies of scope / idiolect / anarchy  
- diversity / social division of labour  
- schizophrenia / decentering / desire  
- homelessness / entrepreneurialism  
- play / chance / exhaustion / indeterminacy  
- fictitious capital / localism  
- financial power / individualism  
- neo-conservatism / counter-urbanization  
- aesthetics / money of account  
- The Holy Ghost / immateriality  
- reproduction / pastiche / eclecticism  
- white collar / commercialism  
- charismatic politics / rhetoric  
- decentralisation / deconstruction  
- antithesis / local contracts  
- strategic management / idiolect  
- androgynous / multiple tasks / trace  
- language games / image / surface  
- small-batch production / social movements / pluralistic otherness  
- heterotopias / spectacle dispersal  
- flexible worker / symbolic capital  
- fiction / self-reference / signer  
- services / temporary contract  
- electronic reproduction  
- being / ontology / deregulation  
- urban revitalization / place  
- laisser-faire / deindustrialization  
- geopolitics / ephemerality / space

**Figure 9 Opposing tendencies in a capitalistic society**  
Source: adapted from Harvey (1988)

Advances in telecommunications are the formidable engines behind the cultural shift towards post-modernity. Telematics networks are linking places in an integrated global cultural system allowing confrontation between cultures rather than their resulting in some common world standard model. As in modern times technological development in communication media allows the separation of place from space (Murdoch, 1993) through the improvement of transportation systems enabling suburbanisation, and especially the introduction and the diffusion of television and the telephone, progresses in telematics lead this process of time-space compression to unprecedented levels. Information, communications, economies, social relationships, culture, instantaneously travel within a
'space of flows' (Castells, 1989; 1997) along telematics networks. But, this space is constructed and shaped by individual choices and actions instead of being an external objective environment. Its subjectivity is therefore an inherent characteristic of the system itself. How to deal with this subjectivity in urban planning and design becomes a focal question to shape the future city.

1.10 Telematics and urban physical form: towards a networking territorial structure

Basically, two apparently contrasting perspectives are mentioned when the topic of the impact of telecommunication and information technologies on the urban physical form comes up for discussion. As Graham & Marvin (1996) describe them: "The first is the role of telecommunications in dissolving the need for physical proximity between people and services leading to the inevitable dissolution of the city and a new form of home-centred life. The second pattern is based on the re-centralisation of certain cities as telecommunications are utilised by the most powerful and important urban centres to reinforce their centrality as controllers of information flows". The first vision assumes that telecommunications provide an "equal opportunity space" which transcends the disadvantages of the physical location thanks to the possibility to access people and services independently by their geographical position (Webber, 1964). As a consequence the city will inevitably dissolve in agglomerate of places, each one having the same opportunities to access the Net (Toffler, 1981; Pascal, 1987). The second vision argues that social, political, and economic dynamics rather than the technology itself lead the impact of telematics (Castells, 1989). Services and networks spread first there where users and clients are located, and only later to other areas – if conditions exist.

Consequently the geography of network access is polarised: major centres are always a step ahead since concentration of people and activities is a factor for competitive advantage for central areas in respect to rural areas and minor centres (Gillespie, 1992; Hall, 1992). Although some activities can be detached from the physical context this does not necessarily mean that the traditional city will disappear. On the contrary, the centrality of cities will be reinforced as main suppliers of services (Gillespie, 1992).

These two perspectives are only apparently contrasting: both are possible and, indeed, both are taking place at the same time. Investigations on home based teleworkers have shown that the immediate surrounding context – home and neighbourhood – has acquired a greater importance for their lives since they started teleworking (Reisen, 1997), generating a demand for certain specific physical, functional and social qualities of the residential environment (Ahrentzen, 1987; Moran & Cullen, 1990). At the same time the process of urban restructuring that is taking place in contemporary "post-industrial" metropolis does not show any evidence of the claimed disappearance, but of increasing concentration. It could be said with Gottmann (1983) that cities will not "dissolve under the impact of this technology, although they may evolve, and are indeed evolving" (quoted in Gillespie, 1992).

This evolution seems to proceed in the direction of spatial structures characterised by a more defined networking nature, which is opposed to the traditional hierarchical model of the "industrial city". Here the centre was the attraction point and the major dispenser of services for the suburbs, which, in turn, where clearly oriented and dependent on the city centre. In this model the centre identifies the real city, while the suburbs are considered as a sort of anti-city which exists only thanks to its relation with the centre. This picture is gradually changed during the last thirty years, evolving towards a variety of more complex configurations.

To Jobse & Musterd (1994), the traditional theories and models of the industrial era based on a mono-centric and compact city with a strong centre, have assumed more a historical meaning than an actual one due to the developments occurred since the fifties. "A type of city where the spatial order was dominated by economic activities, where the choice of location was above all determined by the constraints of transportation and communication technologies. A situation where the balance between the advantages and disadvantages of urban agglomerations was clearly toward advantages. Activities needing contacts were concentrated in city centres, and factories grew up a short distance away along waterways and railways. The predominant population had little mobility and mostly followed in their wake. In most European cities, the vicinity of working places was until the sixties an indispensable
requisite for the choice of dwellings" (Jobse & Musterd, 1994). This model is increasingly challenged by the emergence of new urban structures, a phenomenon especially evident in the USA. Edge cities (Garreau, 1988) describe the rise of large suburban attraction centres which in fact have a liberating function for the suburbs with respect to city centres. Several years before, again in the States, Friedman & Miller (1965; quoted by Jobse & Musterd, 1994) have described the concept of urban field as a whole not characterised by a dominant city, but by a polycentric structure whose borders are the place of the most consistent growth. In this urban field the concept of edge city of Garreau seems to fit quite well.

In this changing territorial context, terms such as "suburb" and "centre" are increasingly losing their relevance. The hierarchical spatial patchwork of the industrial model of development is being gradually substituted by a new patchwork with a networking character, where suburbs and centres are the nodes of the urban region connected by complex communication systems of physical and virtual nature. "The suburb is no longer merely a satellite, an appendix to the proper city, and the proper city is no longer the centre, but one of the many centres in the urban region.... The new city has a networking character and differs fundamentally from the central and nodal concepts as city and urban area" (Jobse & Musterd, 1994).

The result is the Network City (Drewes, 1996) which cannot be thought of any more in terms of fixed spatial development — as traditional zoning — but, which, on the contrary, implies mobility and change (Dupuy, 1991) only possible with a high degree of flexibility (Hillman, 1993). It would be wrong to reduce these evolutions to the simplistic dichotomy 'centralisation vs. decentralisation'. Instead, the complexity of the interaction between physical places and virtual spaces should be recognised, and the inherent contradictions considered as a richness for future cities instead of being ignored or disregarded.

To quote again the work of Graham & Marvin (1996, emphasis added): "instead of single centres linked into some single central place hierarchy, then, very complex networks between cities are emerging based on complex complementary relationships.... But this decentralisation does not represent the end of cities as we know it. Complex combinations of both centralisation and decentralisation are occurring simultaneously, with the world cities in particular the focus of new pressures for more centralisation because of telematics".

1.11 An urbanism of networks

As cities are increasingly understood as cultural artefacts, their meaning is continuously being re-made by the interpretations given by individuals and groups. This subjectivity is a fundamental element of complexity in urban structures, where telematics bring about elements of further complexity. Indeed, applications of telematics create a virtual world that parallels the physical one. People can now decide to make use of these new virtual possibilities to satisfy needs and realise opportunities, overcoming eventual physical hindrances and impediments of the 'real' world. This evolution is going to configure the city of the future as a hybrid combination of physical places and virtual spaces that challenge the way in which socio-spatial structures are traditionally conceived. Socio-spatial settings are acquiring a more defined networking nature, whose structural logic is opposed to the traditional hierarchical model of the 'industrial city'. As networking is the central concept in this evolution, it will be convenient to take a closer look at its meaning in order to point out some elements that are important for the definition of an 'urbanism of networks'.

Networking can be defined as a system of people and places holding inter-connections of different kinds, which co-operate to achieve goals of a social or material nature. This system concerns the building and maintaining of relationships with a wide range of individuals, groups, or institutions that share common interests and goals, and renders possible the use of each other's expertise. The notion of networking involves a number of important aspects.

Inter-connection. This is a fundamental principle in networking, since it supports the idea that networking basically means to operate within a system. By inter-connection we enlarge the focus from the single points within a system to include the relationships between these points.
People's centrality. Especially with concern for telecommunications networks, networking connects people with each other to fulfil a broad range of tasks. In turn, people are related to places.

Discontinuity. Networking is established between points in space. The system created by networking is not, in principle, a homogeneous system, but it comes into being in the points connected in the network.

Heterogeneity. Often, the points connected by networking have different specialisation and weight. This difference makes possible the exchange and the mutual utilisation of expertise and skill, which is the basis of the motivation to engage in networking.

Choice. Networking offers multiple possibilities to reach goals. Since more points are inter-connected in networks, and there are many different paths that could be followed to realise an inter-connection, there are also many alternatives to be attempted.

In the history of spatial planning networks are not absolutely new concepts, although the supporters of zoning shadowed the urban network theoreticians of the past. This has been one important determinant of the prevalence of the hierarchical model of city planning over the networking model in the 'industrial' period. Between 'networkers', Dupuy (1991) recalls the studies and the work of Idelfonso Cerda (the extension plan Ensanche for Barcelona and, above all, the three volumes of his General Theory of Urbanisation, 1867), by Frank Lloyd Wright (Broadacre City, 1943), and of Maurice F. Rouge, a French urbanist who wrote in 1953 an article entitled The Organisation of Space and the Networks. Three basic dimensions of networks clearly emerge from these studies: topology, kinetics, and adaptability.

Topology refers to the geometric or physical configuration of a network, the way in which the nodes of a network are connected. Networks are not abstract entities, they are related to the spatial dimension by connecting nodes in space. This involves discontinuity and heterogeneity. The topology of a network is open and united, and it is opposed to separations such as city/countryside, centre/periphery and zoning. It should ensure a high capacity of communication between nodes.

Kinetics pertains to movement and communication between nodes. It is basically a relationship between space and time: speed. The rapidity of the connections within a network is a measure of the quality of the network itself. For Cerda, for instance, the unlimited possibility in any point of the network of movement, of fast, direct circulation, was an absolute imperative. This kinetic notion of time-space has been perceived since the introduction of electricity, but better understood since the generalisation of Internet communication.

Adaptability concerns the capacity for the evolution of networks over time and space. From the one side a network should be able to modify its structure to welcome new systems or to extend the applications of existing ones. On the other side, it should adapt itself to the needs and desires of its users by offering a multiple choice for the reaching of goals.

Although with a different level of emphasis, these three dimensions can be found in the previous work of almost all urban network thinkers (see figure 10).

Figure 10 Topology, Kinetics, Adaptability in urban network thinkers.
Source: adapted from Dupuy (1991)

In spatial planning networks have been often defined according to a geographical point of view. Networks of infrastructures are channels interconnecting places along lines and pathways for many purposes. Transportation networks support the mobility of people and goods, telephone networks provide people and firms with voice and (some other kinds of) data transmission, gas and electricity networks carry energy from the producer to the consumer, drinking water
networks and sewerage networks deal with water supply and disposal. This conception is focused on a geography of places and may lead one to underestimate the centrality of the human element of networking. Indeed, networks interconnect people rather than places: infrastructures of cables, electric wires, highways, railways are planned and designed in order to serve human settlements. The presence of people is a pre-condition to laying down infrastructures. This distinction, although subtle and maybe irrelevant, for most infrastructures in the industrial period, becomes meaningful as we consider telematics networks. Rather, telematics supports interpersonal relationships independently from the locations of the actors. It mainly supplies interactive tools to facilitate person to person communications for a wide range of goals, from collecting information to the virtual access of facilities, and to communication for social purposes. These general characteristics make evident the prevalence of the human element in telematics networking. In this view, elements of an urbanism of networks should consider the centrality of people in networking by looking at how networks are used by people to reach goals.

A theory of networks proposed by Dupuy (1991) elaborating on previous investigations (Fishman, 1990), recognises the existence of three levels of operators of networks (re-) organising the urban space (see fig. 11). At the first level there are the suppliers of technical networks. They are in charge of providing the physical elements of the networks: streets, cables, wires, water and so on. At the second level there are the suppliers of functional networks. They use the level immediately below to provide services -production, consumption, societal- to the upper level. At the third level the operators are people in their daily life. They make use of the first two levels to create their personal networks by interpreting possibilities and linking places, spaces, services, desires and needs in a single personal behaviour. As the first two levels are still characterised by a certain degree of 'objectivity', the third level is mainly a 'subjective' environment where personal choices are made, even if conditioned by the lower two levels.

This theory of networks based on the separation in non-hierarchical levels shows some similarities with the structure of the OSI (Open System Interconnection) model, a standard model of network architecture developed by ISO to facilitate communications between different computer architectures. This model is articulated in seven layers where the lower ones refer to the physical infrastructure, the central ones to the provision of services, and the upper layers deal with the applications. Each layer uses the layer immediately below it and provides services to the layer above. The similarity of the OSI model with Dupuy's theory of networks does not seem to be a mere coincidence.

The fact that both models are structured in layers, and that these layers range from the physical level to the application level passing through the intermediate level of services, can be traced back to the understanding of the properties inherent in networks. As networks can be understood like systems, these systems can be decomposed into subsystems holding relationships between them.

For example, this systemic conception has rendered possible in several countries to separate the supply of...
physical infrastructure from services and applications running on these infrastructures. This is the case with the telecommunication market, where governmental firms often maintained the monopoly of the provision of basic infrastructures (e.g. laying of cables) while the market of services and applications has been liberalised.

This distinction in levels reflects the articulation in physical, functional, social, and personal components that is inherent to the network city. If we try to understand the city as a technology\(^{12}\) we can identify these components with the hardware, software, and brainware of the network city. In this way we can study the network city as the convergence and superimposition of three subsystems.

— At the lower level we find the physical component of the system, the hardware of the network city. This is defined by the logistic organisation of physical elements: the whole complex of buildings, streets, squares, parks, infrastructures that give physical form to the urban context and the physical relationships between them, their materiality and their position.

— At the second level there are the functional and social components of the system, the software of the network city. This level gives rules and instructions for the use of the city: urban functions, services, social and cultural characteristics of a certain community, and all those facilities and amenities that cement together urban societies. The functional and social components use the previous level and render meaningful its spaces and places.

— At the upper level there is the personal component of the system, the brainware of the network city. At this level the operators are the users of the whole urban system: individuals in their daily behaviour who make choices in order to satisfy their personal needs and desires. The users, according to their own priorities and scale of values, interpret the various possibilities implied in the previous levels.

The three levels are re-combined at the third level, where individuals build their own personal networks. The topological, kinetic, and adaptive characteristics of networks are recombined at the third level according to the discretionary decisions made by people about the easiest, or the most satisfactory, manner to interact with the urban context. The goal of an individual a given moment can have a very different nature: visiting a friend, buying a newspaper, going to the doctor, performing a working activity, and so on. For any of these goals the operators situated at the lower two levels of the system offer a variety of answers, from which the user will choose the most convenient one, and the choice will be made in relation to individualis scale of values. This conception is in line with the centrality of the human element in networking that was stressed above.

Therefore, the study of the relevance of telematics applications for new ideas of spatial planning and for urban design will be placed within the described perspective of the network city and it will assume the point of view of the individual. As we decided to study the network city as the convergence and superimposition of the three subsystems described above, it is necessary to identify the elements expressing the relationships between the different levels.

— The relationships between the software and the brainware can be expressed in terms of activities. Activities are the way in which people (third level) make use of services or interact with other persons (second level).

— The relationships between the hardware and the software can be expressed in terms of programme. The programme defines the requirements for the realisation or adaptation of the physical environment (first level) in relation to a certain set of objectives, while in turn the physical environment conditions the range of possibilities regarding its availability for functional or social uses (second level).

It is evident that planned actions cannot be placed in the third level, but in the first and second levels. Knowledge of the characteristics of the third level is important in order to better shape a respondent environment supporting a real possibility of choice for people.

1.12 Challenges for designers

These changes in contemporary urban landscapes are paralleled and somehow rendered possible by advances
in telecommunications. The evolutions described in the previous sections, over changing meaning of time and space and over networking urban structures, make evident the need for more sophisticated concepts and strategies to approach urban planning. Firstly, to better understand the nature of the evolution in act and the interactions between involved factors; secondly, to be able to plan and design future socio-spatial settings exploiting the potentialities offered by new telecommunications systems. A range of old and new problems affecting contemporary urban settlements can be now faced by adopting new instruments and tools, under condition of rejecting popular myths and easy technological determinism.

These evolutions are a challenge for those actors in charge of planning urban transformations. As traditional urban hierarchical models make room for new concepts based on networking, architects and designers face the question of the interpretation and management of the heritage of one century of modern planning. At the base there is the dichotomy 'city centre-periphery', to which we were used to implicitly refer ourselves with the logic of the thesis and the antithesis. The contradictory attitude of the modern movement in respect to the historical city can be viewed as the origin of this dichotomy. At the same time, the historical city is considered as the standard upon which one can rely: habitable, recognisable, human dimension aspects; and the urban structure to be denied since it has become obsolete through the technological and social progress: permeability, flexibility, mobility (Canonico & Caso, 1994). This distinction loosens relevance in urban structures displaying a networking character, giving way to questions that regard the re-consideration of the already built environment and the planning of new settlements. Some important questions concern the design of the single nodes in the network, and the combination of physical and virtual relations connecting these nodes. What is the role of the different nodes in the networks? Which functions should they host? What are their symbolic and social meanings and how these are reflected in their design? How do they actually network?

Progresses in ICT give to the designer alternative possibilities to think of the organisation of spatial structures at different scales. As traditional time and space constraints become less of a determinant for the accessibility of services and facilities, the result is a higher freedom for the choice of the location and about the desired behaviour of people. Designers should be aware of the increased number of possibilities that nowadays people have to access services and amenities as well as accessing other people. The choice of the position of services and facilities, the way in which they function, the modalities to access them are all conditions that may be re-thought in the light of new possibilities enabled by advances in telecommunications. Indeed, planners and designers are increasingly able to choose from a variety of solutions based on different criteria than the conventional physical proximity between people and services. Of course, physical accessibility will remain an important condition for the desired behaviour of people but will probably acquire a different meaning in the local context.

If urban agglomerations have been approached traditionally as a hierarchy of areas from the city centre to the periphery, the design of future urban agglomeration can be made adopting the reverse approach: looking from the outside inwards (Drew, 1996). Each type of area should be designed by integrating different functions, in opposition to the 'industrial' concept of the mono-functional parts. As more services are directly accessible from the residential environment (the house and the neighbourhood), this becomes more the centre of spatial behaviour of people. Accessibility of services means availability, thus presence even if this is of a virtual type, and the places of this presence must be designed. If the potential action-space of people reach the most remote region of the world thanks to 'electronic highways', the effective action-space (a physical one) is centred around the places from which to access the Net and then stretched to include places of attractions at higher territorial scales. The increasing ability of people to reach services and facilities by means of virtual accessibility can also greatly contribute to improving the quality of life of the most vulnerable social groups, like the elderly or the disabled. Nevertheless, these groups are not yet recognised as an attractive segment in the telecommunication market, with the consequent threat of being excluded from the benefits of the information society. The particular needs of these groups should be taken into serious consideration in the design of future
urban agglomerations. In this networking spatial structure, historical centres should also be preserved as multi-functional areas in order to avoid transforming them in open-air museums.

1.13 What follows

In chapter 2 we are going to analyse several aspects pertaining to the operators at the second level, the software of the system, in relation to the introduction of telematics applications. These aspects concern the social and the functional components of the urban environment: the city of people and the city of services. We shall focus on those elements related to telematics that may lead towards a re-organisation of the functional and social domains of the system. The aim is to point out the relevance of these elements for the operators at the upper level. For this reason we shall define the potentialities of telematics in terms of activities rendered possible. Chapter 3 will deal with the operators at the third level by means of a more detailed description of the characteristics of these activities. The final goal of this operation is to identify those elements that are relevant for the modifications of the programmes on which the design of the physical environment is based. This last will be the focus of the fourth chapter.

Notes

1. Information on the RTD programmes of the European Community has been obtained from http://www2.echo.lu/telematics (the Telematics Applications Programme), and http://www.cordis.lu/fps (the Fifth Framework Programme).

2. By ‘cyberspace’ or ‘virtual space’ we mean a non-physical dimension created by the flows of information along transmission networks.

3. Estimates of the number of Internet users in different countries are available at: http://www.headcount.com

4. Data obtained from RIPE webpage (http://www.ripe.net/statistics/hostcount)

5. For instance, the budget devoted to RTD activities within the Telematics Application Programme was 898 million ECU.

6. Theut asserted that his invention would have supplied people with a remedy against forgetfulness. Instead, Thamus argued that the invention of writing would have produced more forgetfulness since things could have been written instead of be remembered.

7. Own translation of: “Wie met de computer in een mum van tijd alles kan opzoeken, heeft weinig behoeftie aan parate kennis. Volgens sommige deskundigen zullen de mensen daardoor dommer worden. Anderen verkondigen de opkomst van nieuwe, meer op de informatie-maatschappij toegesneden waardigheden”.

8. Own translation of: “Een type stad waarvan de ruimtelijke orde gedomineerd werd door economische activiteiten, waarvan de locatiekeuze vooral werd bepaald door de beperkingen van de transport- en communicatietechnologie. Een situatie waarin de balans van agglomeratievoor- en nadelen duidelijk doorsloeg in de richting van de voordelen. Contactbehoevende activiteiten concentreerden zich in het stadscentrum en de industrie vestigde zich op korte afstand hiervan langs waterwegen en spoorlijnen. De overwegend nog weinig mobiele bevolking was vooral volgend. Nabijheid van de werkplek was in de meeste Europese steden tot in de jaren zestig doorslaggevend bij de keuze van de woonlocatie”.

9. Own translation of: “De suburb is niet meer louter een ‘voorstad’, een aanhangsel van de eigenlijke stad en de kernstad is niet meer de kernstad, maar een van de vele kernen in de stedelijke regio.... De ‘nieuwe stad’ heeft een netwerk karakter en wijkt daarmee fundamenteel af van centrumgerichte, nodale begrippen als stad en stadsgewest”.


11. The OSI is one of the protocols developed when the need of creating a standard architecture to define the communications infrastructure became urgent. The concurrent protocol was the TCP/IP, which is actually the most used protocol for computer communications. On the ‘protocol war’ and on the reasons for the failure of the OSI see Salus (1995). The reason for mentioning OSI here is that it is an example of system concept in networks.

2. City of People, City of Services
2.1 City of people, city of services

The introduction of telematics applications has potential implications for the way in which individuals establish and maintain social relationships and for the way in which urban functions and services are made accessible to people.

Increasingly, the city of people can make use of remote communication to support alternative forms of social experience and interaction. For example, it is becoming increasingly easier to associate with those sharing one's interests instead of one's location thanks to the growing possibility of overcoming time and space barriers (Storgaard & Jensen, 1991). This potential refers not only to the capacity of producing different patterns of social interaction, but even to the possibility to wholly re-organise the criteria on which people build and use their own social networks. This evolution raises a number of questions regarding the form that social and cultural life will assume in future cities that consistently bears onto the way in which future socio-spatial settings ought to be designed.

Similarly, the city of services finds in telematics applications a powerful tool to improve its accessibility and enlarge the range of possibilities regarding types and quality of services, with potential consequences for the position of services in relation to households. Research on time-space budgets in the Netherlands has shown that the reach of jobs and amenities, accessible to households (the action space of households), is a more realistic concept than the accessibility or 'catchment area' of jobs and amenities (Dijst, 1995). Telematics provide people with other ways to reach facilities, and support most urban functions in transforming their internal organisation into alternative forms that are more efficient and efficacious.

The impacts of telecommunications on the city of people and on the city of services are the focus of this chapter. The first part will deal with the most relevant social and societal aspects of introduction of telematics. The second part will focus on the changes in the functional system supported by ICT.

2.1.1 Social and cultural aspects of city-telecommunications relationships

Contemporary culture is becoming more and more 'mediated' as communication tools proliferate. For instance, the role of television programmes in establishing world-wide cultural standards and values is no longer a matter of discussion, even if the positive qualities of this phenomenon remains a highly controversial point (i.a. Condry, 1993; Chomsky, 1994).

Considering the social and cultural aspects of city-telecommunications relationships, two apparently opposing mechanisms become convergent for people:

— emancipation from local situations to merge into the global area of media supported virtual networks;

— and the feedback of these dis-embodiment processes resulting in a different, and maybe more intense, experience of the tangible, immediate, domain of the individual.

The home especially is at the foreground in this context of growing 'mediatisation'. There is a wide range of telecommunications technologies and services that has been diffusing into the domestic sphere during recent decades. From the early telegraph to the telephone, television and radio, to broad-band cable networks, home PCs, mobile telephones, to notebook computers and Internet connections, these technologies are becoming increasingly common in home environments. The mediating effects of technological networks are linking people across time and space supporting interpersonal relationships almost independently from the location of the counterparts. In these cases physical proximity is substituted by electronic communication linking people in virtual communities by network connectivity. Some social activities could be therefore removed from local contexts to be re-organised at other territorial scales in relation to criteria other than physical proximity, as, for example shared interest in a given item (Storgaard & Jensen, 1991). Telematics networks enormously enlarge the pervasiveness of communication technologies in our lives, and have potential influences on the development of our personal, social, and cultural identities. The convergence of digital telecommunications, media and computing technologies feeds the widespread current
debates about the potential social and cultural effects of 'cyberspace' and 'virtual reality' in our cities.

Main themes
These debates are often characterised by extremes of optimism and pessimism. In both cases, far-reaching changes in contemporary societies are being predicted as a consequence of the rise and diffusion of 'virtual societies'. Are these evolution a step towards a better, more equal world, or will they just produce more inequalities? Is telematics a vehicle to emancipate societies from present discriminations based on differences of race, gender, or richness? Or, on the contrary, will it reinforce the position of a dominant Élite? There is little doubt that questions about the equity of the distribution of the social product will also invest virtual societies as they do physical societies. As was already argued by Melvin Webber (1968): "we are now learning how to apply the idea of planning to the city. And when we do, it may well be that our most troubling questions will surround the issues of equity. The industrial age was dominated by the idea of efficiency. The post-industrial age is likely to be dominated by conflicts over equity... Who shall pay?, who shall profit?, and who shall decide?".

At the same time, many stress the alienating effects of telematics on social life, observing that the parallel between virtual reality and physical reality is often disorientating, and that this confounds many of our settled notions about reality, leading us to live in a ‘permanent present’ (Virilio, 1987). This concern is also shared by Italo Calvino (1993). He remarks that the growing number of images to which we are daily exposed has altered the relationship between reality (what we can actually experience) and fantasy (the capacity of giving shape to forms and myths), leading towards more confusion, instead of more quality, of imagination.

Despite the sensationalism produced by opposing determinism of both utopian and dystopian nature, it is likely that the social and cultural changes produced by telecommunications in cities will be absorbed without producing dramatic revolutions, but as a matter of evolution. Indeed "regardless of technology, people are human beings. They need to eat and sleep, walk and talk, love, make love and play. They want to meet other people, compete, learn, achieve, help, inspire and be inspired" (Hillman, 1993). It is, therefore, necessary to debunk all those determinist myths that underlie much of the discussion on this topic, and to assume a more critical attitude towards the phenomena at issue. Things are much more complex and subtle than any oversimplification produced by deterministic positions may suggest.

To draw an exhaustive picture of the social and cultural implications of advances in telecommunications is an almost impossible task. Graham and Marvin (1996) have explored the relationships between telecommunications and the social and cultural life of cities by taking into consideration five key areas. These have been labelled as: "post-modernism and urban culture; social inequality and polarisation; the household as a locus of urban social life; the development of telematics-based social surveillance; and the emergence of 'virtual' communities based on telematics networks". Some aspects within these five key areas are relevant for what concerns our goals.

Globalisation and social polarisation.
Advances in telecommunications play a central role in the changing cultural environment of contemporary cities. As time and space boundaries become less relevant to the behaviour of people and firms, alternative patterns of social and societal interaction are emerging that influence the social and cultural contexts at different territorial scales. A most evident phenomenon is the role of telematics networks in supporting the growing globalisation and internationalisation of information and culture, which parallels the globalisation of markets. The competition between cities to attract investors and resources now transcends national borders entering a global competitive system where cities are considered according to their role in the international ranking, ‘global’ or ‘world class’ cities being the absolute top. A high position in the hierarchy is important to attract the influx of capital and investments necessary to the functioning of their urban machines.

Cities may set up their competitive strategies from multiple perspectives (Dematteis, 1992). Physical accessibility (mainports, high speed railways), quality of services and of the physical environment, amenities, events, the fight against criminality are all strategic
options of primary importance, among which the quality of residential areas and the adoption of policies of telematics introduction are increasingly considered (Manheim et al., 1989; Caso & Drew, 1993). Increasingly, cities are marketed and sold as products in the global market. As telematics networks create a 'global image space', cyberspace becomes the place for the promotion of the city by creating virtual twins of the physical city (digital cities) and/or acquiring major visibility promoting their attraction potential by advertising about valuable places to visit, hosted events, local organisations, etc..

The interpretations of the meaning of these tendencies towards globalisation for the urban social and cultural life are very different. Some observers argue that this will bring about more variety, pluralism, and diversity being a positive element for the construction of a new, freer, social order where differences in sex, race, or income are less of a constraint to an individual's possibility of self-realisation. Nicholas Negroponte, founder of the Media Lab at the MIT and author of essays on the social impact of telecommunications (Negroponte, 1970; 1995), belongs to this school of thought. He finds that the empowering and harmonising capacities of telecommunications technologies should give us some confidence in a better future. Present problems are of a physiological nature since the technologies are still growing, and have to be ascribed to costs and to the little confidence of current adult generations in computer technology. Other more critical interpretations underline the alienating effects of these developments for people, and stress the fact that they are actually producing more inequality rather than filling existing social, cultural and economic gaps between social groups (e.g. Stoll, 1995; Mosco, 1998).

Indeed, there are clear signs in western capitalistic cities of an on-going process of socio-spatial polarisation (Sassen, 1996; Withson, 1998) that is actually being reinforced by current modalities of telematics introduction. Despite the claim that telematics will provide all social groups with equal opportunities to access the networks and their related advantages, observation of current trends shows that this is not the case. Telematics could provide an equal opportunity space, but it currently does not. There is, indeed, a great disparity between social and cultural groups concerning the capacity to access networks and facilities in both virtual spaces and physical places (Aurigi & Graham, 1997). Figure 1 (from Graham & Marvin, 1996) summarises how trends in telematics tend towards increasing polarisation in cities. It becomes increasingly clear that "issues to do with accessibility of people to jobs, services and amenities in cities are now conditioned in electronic spaces as well as urban places. ... The social groups with access to sophisticated telematics can now transcend ... physical limits and rhythms because services, amenities and jobs can be accessed in electronic space without (necessarily) moving in physical space" (Graham & Marvin, 1996). On the contrary, people with a limited ability to access electronic spaces are increasingly disadvantaged. Two main factors polarising the access

![Figure 1](https://example.com/figure1.png)

**Figure 1**
Trends in the introduction of telematics and increasing socio-spatial polarisation in cities

Source: adapted from Graham & Marvin (1996)
of people to telecommunications are costs and computer literacy.

In an increasingly liberalised market, it is not surprising that the offers of services on telematics networks are ever more targeted at the most affluent groups. They have the resources to pay for them and the knowledge to get advantage from them. This process of 'cherry picking' seems to reinforce the tendency towards a more polarised society, where the more disadvantaged groups are being increasingly pushed to the margin of the information society. This trend takes place also in a physical place. As telematics allows supplying services from afar, facilities tend to physically withdraw from most dangerous areas being substituted by their virtual equivalents.

The signs described above are revealing about the critical position of less advantaged groups for what concerns the access to telecommunications and the related benefits. These signs are not encouraging the forecasts towards a more equal society in the future. It is easy to remark how instead many of these groups are the ones who could benefit most from the time-space compression characteristics of telematics. The elderly and the disabled, for instance, are groups that traditionally experience impediments especially in their confrontation with physical space. Indeed political measures and experiments are being presently undertaken to try to improve the situation for what concerns the use of telematics services and applications by these categories. Recently, a course of Internet communications for elderly people organised by the AIM² in Italy has achieved a surprising success with more than 900 demands for participation, where 'only' 140 places were available³. The Telematics Applications Programme of the European Community has a specific research sector in the field of technology applications for elderly and disabled people. This has been preceded by a Pilot and a Bridge Phases under the name of TIDE (Technology Initiative for Disabled and Elderly people)⁴. In these programme researchers, potential users and industries can co-operate to develop innovative systems for elderly and disabled⁵.

Social surveillance.
The trend towards socio-spatial polarisation in cities is reinforced by current modalities of application of telematics for tasks of social control. Increasingly, large areas of cities are constantly monitored with the help of Closed Circuit Television (CCTV) systems in order to prevent and detect criminal activities. Of course, these systems are usually adopted to control activities inside and outside particular buildings/services that could become the target of criminal actions, like banks, governmental buildings, office buildings, sports stadia, or shops. In some cities the different CCTV systems combine with each other so well that whole areas are covered and controlled (Graham and Marvin, 1996). As a consequence, crime is pushed into those areas having minor economical importance, where little control is exercised. These areas are usually low grade thus, this mechanism contributes to socio-spatial polarisation in cities. It is evident that people belonging to the wealthiest categories are the ones who mostly fear crime in public environment, and therefore welcome favourably and promote electronic surveillance in the areas they frequent. Neighbourhoods for the upper class are becoming increasingly 'fortified': gated and walled communities are increasingly common in urban and suburban landscapes of contemporary cities (Davis, 1990). Here CCTV systems are used to enhance the security of inhabitants of the area. The one who is perceived 'not to belong' is immediately spotted, and access to these areas is restricted.

Also in this field, the interpretations of the meaning of these dynamics for people and settlements are very contrasting. The possibilities of telematics for social surveillance usually raise concerns between people. The Orwellian perspective of a society in which each individual, each space, each action could be controlled and 'observed' with the help of 'all-seeing telematics eyes' is feared as being just around the corner. To reinforce this fear there are the possibilities enabled by telematics for individual surveillance. It is a matter of who is in a controlling position and who is not in control, thus being the controlled one. For instance, many applications in a work environment allow employers to keep control over employees to detect unproductive behaviours (Aiello, 1994). On the other hand, as living in large cities is increasingly perceived as unsafe and dangerous, the growing controlling capabilities rendered possible by telematics are welcomed and promoted not only by the wealthiest, but they also look attractive to other social categories. The
underlying idea seems to be: if you're not a criminal, you should not be feeling threatened by telematics surveillance. The question is in how far we are ready to permit an invasion of our privacy in exchange for better living conditions.

_Homes as a locus of social life._

In this context of globalisation and growing polarisation, houses and residential neighbourhoods seem to assume added importance for people's social lives (Ahrentzen, 1987; Moran, 1992). Although many predictions about the emergence of a 'domestic society' are certainly exaggerated, there are clear signs of an increasing home-centredness in contemporary societies. It is generally argued that this trend is a consequence of the growing 'mediatisation' that is invading domestic environments. According to Baudrillard (1987), nowadays the domestic space is conceived as space of connection and operation, as a control screen, as a computer with telematics potentialities that permits the remote control and performance of any activity including work, leisure time, consumption and social relations. Nevertheless, it seems that the contribution of these technologies to home-centred life styles should be considered more in terms of answers to emerging urban problems than as an engine of a home-centred life per se. As public environments are experienced as dangerous places, as the performing of many activities causes stress between users, then the possibilities of remotely performed forced behaviours from 'safe' places will obviously be welcomed by citizens.

Increasingly, dwellings and neighbourhoods configure themselves as 'islands' connected by means of telematics bridges. Whether this development is a departure point for a new way of experiencing cities, or whether it means a sort of withdrawal from public environments, it is a question that is difficult to answer. Moran argues that the parallel between increasing home-centredness and less involvement in community life seen as purely competitive forces is not justified. These forces can better be regarded as complementary and maybe even compensatory, leading to a more complex situation than a simple 'black and white' concept (Moran, 1992). Probably these two possibilities will occur simultaneously for this will be more an individual decision taken on the basis of an evaluation of the characteristics of the surrounding context in relation to the specific task to be pursued. In other words, it will be a personal evaluation made from the third level of the network city model of the characteristics of the first and second level. It is the perception of the individual's capacity of coping with the context in a specific moment and in a specific place.

_Virtual urban communities._

In both cases, there is little doubt that telematics make it possible to create virtual communities independently from spatial constraints. These virtual communities should be considered as a complement to and an integration to more traditional communities based on physical encounter, that are usually spatially defined, and not as their substitution. There are different motivations leading people to engage in such communities.

_Specialisation._ The possibilities of congregating with others on the base of shared interest in a given item are strongly improved by telematics. Fan clubs, discussion groups about a variety of subjects, scientific communities increasingly use digital networks to transcend temporal and spatial limits to the performance of this behaviour, and to enlarge their dimensions. Talking with other people having the same interests to exchange points of view can be done as well by telematics, which is also a medium to support other modalities of interaction for the same scope.

_Availability._ For others, the main reason to engage in virtual communities is the desire to keep contacts with other persons who would be hardly available otherwise. Think, for instance, of relatives and friends who live far away, and who can be regularly met in cyberspace. Whether this is a satisfactory alternative to physical encounter is not a real question. Very often this is the best alternative for maintaining social relationships in spite of temporal and spatial constraints. At the same time people may have the desire to be more easily contacted for a variety of reasons. Having one or more virtual addresses is a facilitating factor in these cases. For instance, the software for instant messaging that is becoming increasingly popular permits integration in a single tool for more communication systems and services with a better accessibility.
Adventure. Cyberspace is also a new frontier to be explored in search of new sensations. On the Internet, for instance, there are plenty of chat rooms, discussion groups and other possibilities to contact other people. The motivation here is the desire to discover new friends and situations. Sometimes this behaviour has no intention of establishing continuous relationships, while, at other times, it produces more stable results. Many friendships and loves have actually seen the light via the Internet. The desire of making new encounters, even if of a virtual type, can be also produced by a feeling of alienation or isolation in the socio-spatial immediate environment of some people. In these cases cyberspace offers the possibility to (partially) emancipate oneself from the restrictions of local situations to meet new occasions and opportunities. Of course, this is not a solution for the main problems.

Playfulness. Another motivation for engaging in virtual communities has more of a playful nature, and it is somehow connected with ‘adventure’. It is the possibility to give free rein to other ‘selves’, by playing other roles or pretending for a moment to be a different person. The anonymous character of many communication applications facilitates these behaviours. Indeed, people can enter a chat room just giving a nickname, and they are considered only for what they say or, better, for what they write: no past, no future. This possibility is much more important for many persons than it may seem at first glance. It gives these people a way of release from their frustrations and stresses inherited from fixed routines of ‘real’ life. Escaping from reality by playing another role often makes the confrontation with the physical environment seem less threatening.

Another phenomenon linked to virtual urban communities is with regard to the so-called digital cities and digital regions (Cornford & Naylor, 1998). These virtual aliases of real cities are often promoted by municipalities with the aim of improving accessibility of services of civil administration and management. The digital cities usually offer information on municipal services and make it possible to carry out some tasks. Additionally, there is space for organisations, companies and firms to advertise their products and services in order to be more easily reachable. More interesting for our task is the effort made by digital cities like Amsterdam DDS⁶ (De Digitale Stad) to offer these virtual spaces as places of encounter and exchange, a virtual environment of sociality. To this end, there are possibilities for inhabitants to have an e-mail address, to build a ‘house’ in the digital city (which is a home-page), to visit thematic cafés where they meet aliases of other persons to talk about various topics, or to join discussion groups.

Basically, digital cities are sites on the Net. They can assume different forms, where the analogy with the physical city (real or imaginary) is often pursued. Some digital cities are just a clickable list of sites and home-pages of organisations and people. Others, like Amsterdam DDS, have a more complex structure. The DDS (see fig. 2) does not resemble the physical Amsterdam, yet it is organised according to a city analogy: a number of thematic squares surrounded by ‘buildings’/home-pages. Finally, other cities pursue the analogy with the city of origin in very great detail. An example is the digital Helsinki⁷, which is being designed as a perfect copy of the real city. Moving in the streets of this digital city, ringing at the door-bells to place a telephone call or to activate another telecommunications system, visiting monuments and places of interest as you are moving in the physical Helsinki.
The analogy between physical cities and virtual cities has been already discussed (Graham & Marvin, 1996; Aurigi & Graham, 1997; Drew, 1998a). On the one hand, this analogy allows a more familiar approach to the digital cities making their use by people much easier. On the other hand, it has been remarked that this analogy is misleading since it suggests a correspondence between physical places and virtual spaces that has no reason to exist. Indeed the 'real' world and the digital one respond to different kinds of rules since constraints and drives to move in one or in the other one are different. Pushing the analogy further than a linguistic meaning may lead to consider the laws of the one valid also for the other.

**Tele-activities to support interpersonal relationships**

The aspects summarised in the previous sections indicate an idea of the complexity of social and cultural dynamics associated with the introduction of telematics services. Now we want to consider those telematics-mediated activities having a specific social meaning for people as they rely on remote communication to support inter-personal relationships.

It is probably useful to remark that almost any activity has a social value as well as a more functional one. So are working, shopping or banking, for instance, in which inter-personal relationships often play a decisive role. In spite of this, we will focus on a group of activities specifically serving purposes of social interaction whose social value can be also considered independent from a functional one.

Telephony remains the most important means for remote communication for inter-personal relationships. The, by now, very traditional systems of voice telephony are making advances that are likely to increase their attractiveness also for tasks of social communications. Between these are systems of voice messaging and call source recognition. The telephone has got new functions like the possibility to connect more telephones in a multiple conference. Visual displays and phone keyboards have rendered easier the use of telephones also for handicapped persons. Cordless telephones are increasingly common, facilitating the use of equipment by individuals in collective spheres. Digitalisation of switching centres and the implementation of fibre optic cables has enabled a faster and more reliable transmission of signals, along with higher traffic capacity. Fax and data transmission becomes easier and more convenient, as communication is in a way other than voice. This is facilitated by connection with ISDN lines that have a higher capacity than more traditional analogue lines. Cellular telephony is getting increasingly popular in advanced countries. Especially the market of GSM know a fast growth as the social, cultural, and economic effects of globalisation are being felt. In the small cellular telephone one can find the integration of many communication systems and functions: the cellular telephone becomes fax, mini-computer, calculator, electronic agenda, alarm and so on.

Many of these systems can be extremely useful for handicapped people. Furthermore, advances like the possibility to transmit/convert communications in Braille texts or spoken/written texts (for blind or deaf people) make available the use of remote communication systems also for these categories. Video-telephony is one of the new systems that can have a particular relevance for such people. To reach an acceptable quality of transmission, applications of video-telephony recommend, if not demand, ISDN connections.

However, it has to be said -continuing a major theme highlighted in the previous sections, that many of these advances are expensive and need some knowledge to exploit their potential. Thus, they are more easily accessible and used by well-off and high-educated people, while all the others are likely to experience difficulties in order to enjoy the potentialities.

Be it an ISDN or a more traditional system, telephone lines are by far the most used basic infrastructure to support computer mediated communication. The most personal computers are connected to the Net via modem + telephone infrastructures. In countries like the Netherlands, where almost every house is served by TV cable, this infrastructure provides a valuable alternative to the telephone lines. Connected to these networks, personal computers become powerful communication means that open many different possibilities to interpersonal relationships. In the previous sections we have already mentioned the many variants and the motivation of people to engage in computer mediated communication. The main tele-activities having a specific significance in supporting inter-personal
relationships are E-mail, Instant Messaging Systems, Chat Lines, Computer Supported Discussion Groups. With the help of a web-camera and a microphone, computers support voice and video communication as well as communication in the form of text. In the next chapters we will give more information on several time-space and design aspects associated with these social tele-activities.

2.1.2 The City of Services. Re-organisation of urban functions
The functional system of an urban settlement refers to all those functional relationships that make the city working. These relationships can be described in terms of urban functions by grouping similar kinds of relationships into one urban function. Traditionally, a distinction in urban functions is made between living, working (employment), supporting facilities (including recreational, educational, commercial, medical, etc.), and transportation (infrastructure, connections). Nevertheless, as we want to investigate the influence of telematics for the functional system of cities, it will be convenient to make a more detailed distinction. Thus we reviewed a total of twenty urban functions (Fistola, 1992) by looking at how the introduction of telematics can modify their organisational structures in comparison to a more 'traditional' (industrial) functioning. The urban functions we identified are listed below.

Residential
Working

Supportive facilities:
Civil administration and management
Education, training and research
Medical prevention and health care
Religion
Production
Trading
Services to production
Credit and insurance
Defence and civil protection
Personal and collective security
Management and control habitat
Tourism and receptivity
Culture
Leisure time
Legal

Transportation:
Mobility of people
Goods mobility
Information mobility

All these urban functions can offer urban services, that is the way in which urban functions operate. The urban services are part of the urban functions with which the urban dwellers ('clients') are in touch. The relationship between urban services and 'clients' engenders activities. In this way an urban function is formed by some functionally grouped services; an urban service is organised around a group of activities; an activity is behaviour enabled by its relation with an urban service. In other words, the functional system (described by the functional tree: urban functions - urban services - activities) can be considered as the software of the city as far as its physical system (a certain logistic organisation of the physical elements: parks, streets, squares, buildings, etc.) is the hardware of the city. As a matter of example, the functional tree of the urban function "Education, Training and Research" concerns a series of services like the transmission of knowledge at various levels and for different purposes, the production of knowledge in different areas, and other related supporting services. The use of these services by the urban dweller enables activities as studying, doing research, teaching, giving lectures, etc. The hardware corresponding to this software is formed by different kinds of schools or educational facilities, research institutes, libraries and so on.

The most evident consequence of the introduction of telematics in the functional system of cities concerns demise of many constraints of physical proximity between parts of functions and between people and services, due to the possibility to overcome space with time. The possibility to overcome temporal and spatial limits by innovative telecommunications systems can lead many urban functions to transform both their internal (physical and organisational) structures and their external functioning: the way in which services are delivered to users. Briefly, this means that:

— on the one side, services once considered as a necessary unity can be now separated in functional units and (eventually) spread in space. This especially applies to the location of information in relation to the proper
service, or to the physical realisation of products in relation to their design;

— on the other side, most functions can be remotely accessed by users thus requiring a number of automated and/or "on line" services, with all the related consequences such as the legality of operations or the degree of inter-activity of the system.

In many cases the potential for the re-organisation of urban functions by introducing telematics is already at a quite advanced stage. For instance this is the case in the banking sector, where telecommunications has been introduced to facilitate transactions and connections between headquarters and branch offices, between different banks, and to ease the access for clients to information.

In the following pages we are going to analyse the above-mentioned urban functions to look at the potential modifications in their structures that can occur through a large-scale introduction of telematics. This hypothetical change is partly based on available information on recent developments and on-going processes, and partly on technically possible and expected futures.

Living and working.
The relationship between people and urban services can be seen from two sides:

— on the one hand there are the persons who make use of the services offered. These are clients or consumers. Their inter-actions with urban services give rise to various activities of consumption;
— on the other hand there are those who produce the services for the clients. These are the workers or producers of services. This enables working activities along with all other activities to support the main task of the production of services.

Services to support living are mainly included in the first category, while working belongs to the second group. In the following parts we are going to summarise the general aspects of the changing residential and working functions due to the introduction of telecommunications. Then, these indications will be particularised for each urban function.

Residence is the most diffused urban function. It concerns the places where people live. In 'modern' times it has increasingly assumed a meaning of isolation and shelter from the bewildering outer environment, the safe haven where one can return after a day at work spent in hostile environments. Presently it is mainly a place of consumption, the final link in the production chain of services and goods.

It has not always been in this way. In pre-industrial times living and working were often performed in the same place, giving to urban environment that peculiar mix of features still characterising historical city centres. The industrial revolution altered this age-old socio-economic structure by concentrating work activities in factories located along the main transportation axes and in proximity to sources of energy. Housing for the work force followed factories, giving birth to unhealthy neighbourhoods where people often lived in extremely poor conditions. Especially in England this produced the development of new industrial cities as Birmingham, where the new dominant bourgeois class underlined its new leading status by locating its place of residence away from the unhealthy areas around the factories. The bourgeois conception of dignity combined with positivism expressed itself in the industrial city through the introduction of zoning regulations. The idea behind zoning was the attempt at improving order and efficiency in an increasingly complex urban landscape by separating functions in space. At the same time it revealed itself as an almost perfect mechanism to keep away productive activities (and above all their undesired consequences as noise, pollution, traffic) from residential areas of most wealthy social categories. This conception has continued until the present day and still affects present modalities and techniques of urban and territorial planning.

The introduction of telematics applications challenges this urban structure. An ever-growing number of activities can be remotely performed from residential areas with the support of telecommunications. Functions like working, shopping, and banking once had their only possible location in city centres or at the border of suburban development. Nowadays they are increasingly assuming a networking structure in which dwellings and residential areas are poles just like the shop, the office, or the bank. These networks are
supported by ICT in their functioning, creating a single environment of interaction independently from the physical spatial discontinuity of places of operation. In this way the residential area losess its exclusive character of place of consumption and potentially acquires also a meaning of place of production. This evolution opens up a new perspective of thinking to residential areas. For instance, Pauline TerreHorst imagined future ways of living as the re-discovering of family life. According to her, the opportunities offered by telematics will give people the possibility to better re-organise their time-space rhythms in order to find more time to enjoy each other. Homes and residential areas will be designed according to what she labels 'the farm mould' (TerreHorst, 1994a; 1994b).

Central questions concern the search for new relationships between living and working, living and facilities, living and transportation, which means the definition of new functional relationships between different territorial scales. If residential areas are undergoing a process that leads to their 'hyper-utilisation' in contemporary settlements, where are and what are the places and spaces for new uses and lifestyles? Which characteristic and which spatial organisation are imaginable for residential areas as their meaning for people is changing? A brief analysis of changing functional context that follows will give some indication on these questions.

**Working** is one of the main urban functions. It refers to all these activities of production, transformation, servicing by means of which individuals and groups contribute to the society. The aim of being engaged in working activities is the earning of an income to be exchanged against other services or products.

“**Working**” is undergoing a process of rapid transformation under the effects of innovation in telecommunications. The labour market has radically changed during the last decades. It has acquired an international dimension where new professions, new forms of working are emerging. Firms and companies are restructuring their organisations towards more flexible structures. Increasingly, technological literacy is a major requisite for getting a job. Working as employee in public or private firms/institutions or performing autonomous work (e.g. as professionals do) is nowadays supported by a variety of telematics applications, which open up a broad range of new possibilities (Di Martino & Wirth, 1990). The new way of working is tele-work, which is working from a remote location other than the traditional office. As a consequence, the concept of physical vicinity between workers and offices, and between inputs, clients and firms, is paralleled by the new concept of virtual vicinity by which time and space barriers loose part of their constraining relevance. Workers can perform their jobs by a remote location using mobile equipment or facilities in different kinds of detached offices. The house is one possibility, but many alternatives can be brought to mind (Caso & Tacken, 1992).

The office building, the cornerstone of the ‘industrial’ mode to organise work, gives way to a range of more articulated and complex possibilities based on a combination of offices: headquarters, detached offices, mobile offices, organised in a networking structure. It is possible that headquarters are virtual entities, like an E-mail address or a home-page on the Internet, co-ordinating several detached or mobile offices located elsewhere. Additionally, the choice of the place for the physical headquarters is now increasingly dependent on factors other than the availability of workers or the proximity to major axes of physical communication: a representative location, for instance, or a less costly area (Dewulf, 1995)

**Supportive facilities.**
Supportive facilities are all those urban functions that make socio-spatial settings work. They cover a wide range of situations that may present themselves in an organised society, from civil administration to health care, from trading to education, from credit to production, from leisure activities to culture. Below we present a brief summary of these functions trying to focus on those elements in which telecommunications play a role and that may lead towards a re-organisation of the respective sectors from an ‘industrial’ modality to a ‘post-industrial’ one.

**Civil administration and management** is an urban function that works for the management of a city. It performs the management and administration of the urban area through the services offered by national and local governmental bodies. It co-ordinates the
functioning of the different functions in the city by setting up rules and standards to which all citizens, firms, and organisations are bound. At the local level it holds a registration service by which the status (name, date of birth, civil status, family status, residence, etc.) of the inhabitant of a certain city can be certified. The definition of policies and strategies for the development of the city is also a primary task of this urban function.

In 'modern' times many other urban functions, as for instance education and health care, were considered as an integral part of the 'civil administration and management' urban function, being under the direct management of city councillors. Ongoing processes of deregulation and market liberalisation in western societies have somehow altered this situation. Nowadays, national and local governments are increasingly assuming more of a controlling function.

The modern organisation of this function was structured around a spatial (physical and functional) concentration of services in one single place, the Town Hall, often a building within which many representative functions were concentrated. This concentration was essential in order to maintain a physical proximity between people, services and information. Those needing information or documents had no other choice than to physically go to the place, fill in a number of forms, and come back some days or weeks later to get the required information. The introduction of telematics in this sector has rendered virtual proximity a practicable alternative to physical proximity, enabling possible changes in the internal organisation of the function along with an improved accessibility for users. In this sense ICT developments are associated with questions regarding 'democracy' and 'service delivery' (Severijnen et al, 1996).

Some points for a possible re-organisation of the 'civil management and administration' urban function in relation to telematics introduction are listed below.
— The procedures for obtaining information and certificates has been radically simplified by the use of computers. Electronic accessibility of data bases and search engines have made the processing of the information much faster. Very often documents can be obtained in few minutes.

— Cities like Bologna in Italy are experimenting with the electronic signature, often under the form of a double password as key to electronically access some services from a remote location. The delivering of official certificates and documents to people can be done
without physical movement from either side (the consumer or the supplier) and in 'real time'. Similarly, consumers can also utilise this electronic version of certificates to fulfil the tasks for which they need them.

— Municipalities are developing electronic twins of the real city. These 'digital cities' can be accessed via electronic networks and contain all kind of information about the cities. They often build their own home pages in the digital city to make information easily accessible.

— Many other operations are presently performed by applications of telematics, or at least it is expected they will be performed in the near future. For instance it will be possible to pay taxes by electronic payment, or to vote at elections by network connectivity.

— The update of information is made 'on line' and in real time, and it is immediately accessible from anybody entitled to it.

— The possibility of accessing databases and information from a distance renders unnecessary the concentration of municipal services in a single place. If convenient, municipal offices can be split up in smaller elements, but still work as a unity.

— The supplier can do some of this work from any location, including the home.

— Municipalities are using telematics for a better control and organisation of the cities they govern. Between other applications, the use of ICT makes possible an easier comparison of data in order, for example, to fight against fiscal frauds and tax evasions.

The above-mentioned potential transformations make possible the re-organisation of the urban function. A network of units connected by virtual and physical infrastructures can be substituted for the single-element structure. It can take the form of a 'headquarters' for more representative functions and a number of branch offices, up to the access point of consumers and tele-workers. Tele-information, tele-work, requesting forms are the activities now enabled in the residential area.

*Education, training and research* is the urban function that deals with the education and research sectors. The services offered by this function concern teaching at different levels (transmission of knowledge from basic to post-graduate education), the production of scientific knowledge and applied research.

Traditionally, the places devoted to education, training, and research have been schools, colleges, universities, research institution (like the TNO in the Netherlands or the CNR in Italy and the CNRS in France) or the research departments of large firms or institutions. The services offered are usually physically concentrated in buildings as schools or, for more complex structures with institutes or departments, a number of buildings in a certain urban area. In these cases each building houses a group of institutes that are considered as separate entities. The choice of the place to locate these services is related to the concept of catchment area and to the degree of physical accessibility required by their users. Schools are located at different territorial scales according to the level of instruction, neighbourhoods being the places for basic schools and the large urban area or the region the location for higher education and universities. The research departments of large firms were often physically connected to the places of production.

This picture is being changed by introduction of telematics. Functional concentration of services can be understood also in a virtual sense, while the use of the services by individuals and firms recognises other alternatives to the physical presence on a site. Research on the application of telematics to educational tasks has shown how telematics can become a very helpful tool in teaching and learning (Veen & Vogelzang, 1992).

— Computers have made the learning process more efficient. Connections to telematics networks give the possibility to access and make use of large amount of information and data. This also requires new methodologies of learning, a good level of computer literacy along with new abilities to avoid getting lost in an ocean of available information.

— The different parts of the education process; knowledge transmission, discussion, application, and testing, can be separated in time and space. Lessons and knowledge can be remotely accessed at any time by telecommunications. This concerns both the 'on-line' virtual presence of a physical interlocutor - a teacher, an
expert- and the access to data-banks and recorded information, between including traditional books.

— The production of knowledge is also facilitated by telecommunications. Computers make the work of the researcher faster and more reliable, allowing the possibility to compare and process large amounts of data in a relatively short time, and offering new methods of investigation that were unimaginable with traditional techniques.

— At the same time networking allows possible cooperation with other researchers located elsewhere in the world and accessing specific knowledge to support the process of investigation.

— This holds good for the research departments of large firms as well. Researchers can work in their preferred time-space situations while remaining a part of the research team thanks to network connectivity.

— The introduction of ICT in the educational process calls for new teaching methodologies. Educational staff should be also able to work with computers and telecommunications to transmit knowledge. Additionally, computer literacy will become an essential propaedeutic teaching in tomorrow’s schools.

— Courses can be no longer organised according to the kind of school but more according to the subject, where the level of the required knowledge remains dependent on the kind of school. Students in technical matters, for instance, may need a deeper knowledge of mathematics than students in language matters, but basic knowledge is common to both.

— Parts of the standard equipment of any school can be physically detached from the school and be accessed by telematics. Here, we especially think of libraries. It will be easier to integrate teaching programmes with other more specialised knowledge.

— In addition to traditional or pre-configured educational programmes, it should be possible for people to assemble their own educational sets to better meet the individual’s own demands of education. This is especially helpful for those persons who need to update their knowledge or wish to receive further education without having to engage in fixed programmes (consider, for instance, retired people).

— Those who transmit knowledge, teachers and experts, will be no longer necessarily located in schools, universities, or research institutes, but they can offer their services from remote locations.
— Information about the activity of research institutions and on the demand for specific research will come together in an easier fashion on the Net. Information on programmes of other bodies such as the European Community is available on the Internet, along with the requisites and the modalities to access the funding.

— The Internet is increasingly the place for ‘brainstorming’. ‘Forums’ and ‘discussion groups’ can be launched to debate specific matters, in order to find out problems, possible answers, and to gather opinions.

— The knowledge produced by researchers and the basic information for the research activity will be easily accessible by means of electronic networks. Specialists and services to support investigators, as market research and opinion surveys, will be located on the Internet and therefore accessible in ‘real time’ regardless of distance. There will be a wide offer of these services from which to choose the most convenient.

— This holds good for the research departments of large firms as well, which are increasingly co-operating with other research institutions and firms, or which commission parts of their research to external research bodies. The place of research, the laboratory, and the place of production become more separated entities but still connected in time.

These possibilities can lead to a re-organisation of the whole sector. As telematics opens up new possibilities and requires new methodologies of teaching, learning, and producing knowledge, then schools, universities, research departments etc. should be able to welcome these new forms of research and education by physically re-arranging their premises, (e.g. introducing computer rooms, screens, electronic libraries, etc.), and by adjusting programmes and timetables to the new possibilities. The whole function will assume more of a networking character, where schools and institutes will be major poles of a system that includes minor educational centres as well as the homes of participants (as students, teachers, researchers). Of course, the role of places of education as social catalysts is not replaceable by any virtual form of education, nevertheless parts of the teaching, learning, and research activity can be organised in more complex and articulated forms that better meet the desires and needs those concerned by increasing the number of alternatives. Tele-learning, tele-education, tele-information, tele-work, are new telematics modalities paralleling the traditional ones.

**Medical prevention and health care** is the urban function concerned with the medical sector. It offers services of medical prevention and cure aimed at the maintenance of an individual’s mental and physical capabilities to deal with the surrounding socio-spatial environment. Therefore, besides the most traditional medical domain it encompasses other branches that cater to the well being of individuals.

For a long time ‘health’ has been considered as the absence of diseases. This illness-oriented conception is being actually transcended by broader definitions of health. The emphasis is no longer placed on the simple matching of the medical needs of people, but on well being as a more comprehensive dimension that refers to the quality of the relationships between individuals and context. The introduction of telematics in the medical prevention and health care sector can better investigated in this ‘socio-ecological’ conception because of the potential benefits for a better and more efficient diffusion of medical services, and for the improvement of the relation between person and environment.

Traditionally the places of operation for this urban function have been hospitals, medical centres, laboratories, doctor’s surgeries. They are strategically located in relation to the population they serve and to the required degree of physical accessibility, which is the most important concern for emergency departments in hospitals. Usually they have little connection between them: the different steps in the system, from the doctor to the hospital, take place in subsequent times and different spaces. Urgencies are usually dealt with at the casualty departments of hospitals. The time-space characteristics of telematics can change this situation and make possible alternatives for the re-organisation of this sector (Veneris, 1992; Gott, 1995).

Telecommunications makes information easily available and accessible. In the area of health care this applies to different items.
Preventive information relates to a variety of situations such as medical education: what to do and how to react in cases of emergencies, healthy life styles, how to recognise symptoms of bodily and mental malfunctioning, and caregiving. Other information concerns the location of the services and where a specific treatment can be done. How to make use of these services, costs and modalities to access the services are also a matter of information for the health care system. All this information can be now accessed virtually from a remote computer connected to a telematics network.

Prevention also refers to preventive care. Here information can be used to provide vulnerable categories of people with personal care in specific situations: for instance a period of the year when the danger of illness is greater, an epidemic, or during pregnancy.

Categories of people with specific health related problems, like the elderly or the disabled, or terminal patients in the long term who need a more continuous monitoring of their health conditions can be assisted with the help of ICT. In many cases internalisation in hospitals or medical centres is no longer the only possibility.

Telematics applications offer a great potential also in the field of medical cure.

Health care services can be also remotely accessed when the equipment is available. This refers to many situations as check-ups, screening and diagnostics, drugs prescription.

It is possible to access the opinion of specialists in specific health care matters regardless of distance and often in 'real time'. This applies to both patients and doctors. The access to skilled knowledge once restricted to the main hospitals can be now made available independently from time and space constraints.

According to a new 'socio-ecological' conception of health, other issues than the traditional medical services become relevant for the well-being of individuals. Correctly introduced, telematics offers tools to facilitate the relationships between people and their environment. Some of these possibilities will be analysed in other sections. Here we want to stress some applications that are more directly linked to the well being of individuals.

Alarm systems have an indubitable re-assuring function. They contribute largely to improve the feelings of security and safety in people. This is an important
condition for the quality of life, in particular for the weaker social categories.

— Systems of personal surveillance can be useful to control those persons whose mental capabilities are declining, such as people affected by senile dementia. This is an important help especially for the caregiver.

— Smart home technologies can help people to monitor and control the functioning of domestic equipment, sometimes from a remote location. This group of applications can improve the quality of indoor environment also contribute to the well-being of individuals.

— Concentration of medical services and knowledge in a single place, like the hospital, is no longer necessary. Alternatives are possible. The choice depends on factors other than the functional need of physical proximity of patients and services/knowledge. Many services can be delivered from a distance, especially concerning routine controls and check-ups. The need for internalisation of patients will be reduced.

— Some of the traditional services of a hospital can be located elsewhere and still be accessible in ‘real time’. This is certainly possible for management functions and, to a certain extent, for laboratories.

— The lower levels of the system, like medical centres and doctors, will eventually use telematics to access specific knowledge located in major health care poles or free lance specialists.

— Home care will be further developed and implemented as a modality of providing the necessary assistance to patients instead of internalisation in hospitals and cure facilities. This especially applies to categories of people like the elderly and the disabled for which internalisation is often the only possible solution at present.

Doctors, medical centres, laboratories, hospitals, cure facilities etc. will be connected in a single virtual environment of communication. Each part will be a point in the network where major hospitals will be the poles at the higher level with an influence on larger territorial areas. This network will embrace doctors’ surgeries and the homes of specific categories of patients. Health care tele-centres will be introduced at local level to support a sustainable decentralisation of health care services. Of course, the needs for hospitals will not decrease, but they will acquire a leading function in the network more than ever before. Tele-health care and tele-medicine, tele-education and tele-information, are new telematics activities originated by the introduction of ICT in the health care sector.

Religion is the urban function that deals with faith. It embraces services linked to the religious creed of people as masses, religious education, religious marriages and so on. This function has been also touched by the wave of innovation in the sector of telecommunication. Nowadays TV programmes on religious subjects are complemented by a number of possibilities and services including information, education, discussion groups, chat lines. Religious groups are increasingly present on the Internet, and they use telecommunication to support their activities both for the diffusion of religious opinions and in pursuing their activities as believers.

The relevance of telematics in the ‘religion’ urban function is mainly used to render possible the participation in religious events by believers suffering from impairments. Video-recordings, tele-education, tele-information are new activities produced by the introduction of telematics.

Production is the urban function concerned with the manufacture of goods. The services it offers are related to the supply of goods to the distribution sector. It produces the goods the society requires to fulfil its needs.

The traditional places of operation for this function are factories and artisans’ workshops, and farms. In modern times the industrial revolution has given this function a central place in the organisation of society. Transportation infrastructures and housing for workers were built in relation to the position of factories, which, in turn, were located close to energy sources -in early times- and along major transportation axes -once the network was established. The new rich class built their houses in relation to the location of factories, but in the opposite sense. They used distance from the dirty unhealthy surroundings of factories where the working class was located to enjoy their novel status in most healthy, ordered, and ‘respectable’ neighbourhoods from which productive activities were banned.
Many changes have occurred since those times. Factories are no longer the main place of work for people and the living and working conditions have improved. Progress in information technology has completely transformed the production sector and many other changes are on the way. Many operations in factories have been rendered fully automatic, thus requiring little direct human intervention. The use of Computer Aided Manufacturing (CAM) makes possible the management of production processes from a distance. Computerisation brings more flexibility in the production processes, so that nowadays it is economically possible to produce individually targeted goods. The different parts of the traditional factories can be nowadays split up and re-located according to the desired strategy of the company. The activities of design of new products, of market research and research on new materials or production processes can be done in other places as well, and sometimes given to an external specialised firm (see ‘education, training and research’ and ‘services to production’ urban functions). They can also opt to directly handle the distribution of their products thanks to the improved organisational and informational capacity of telematics.

Researchers are developing the faber, a type of fax based on the combination of applications of information transmission and laser techniques that is able to reproduce three-dimensional objects from afar. For the moment its applications are limited to tender plastic materials, but it is already foreseeable that once developed the faber will bring other revolutionary changes in many sectors, particularly the production of goods and their distribution (see ‘trading’ and ‘goods mobility’ urban functions). Activities produced by the introduction of telematics: tele-work.

Trading is the urban function that deals with the commercialisation of goods: the organisation, the systems, the places of commerce. The goods manufactured by the ‘production’ urban function are made available to people by means of the distribution sector of this function. Sale is the service offered by ‘trading’ that is accessible to clients. Additionally, other parts can be recognised such as the storage of goods and the management of the selling process, the ordering of goods from producers and selling strategies.

The most conventional form of trading with which people come in touch is the small distribution, but there are other levels too. Before goods arrive at the shop to be sold to the public, a traditional step is the large-scale distribution. This one is the connecting link between producers and small distribution. Another level that can be recognised is the sales representative, who usually travels to shops and people offering goods. This one can be a connection between small-scale and large-scale distribution, or between small distribution and clients. It can also act independently as a free-lance. Some producers use this system to side-step the whole trading chain by getting directly in touch with consumers.

Warehouses, supermarkets, shops are the traditional places of commerce. Shops are usually located downtown along the main commercial streets or in shopping centres in suburban locations. Supermarkets and warehouses are taking over an increasingly larger share of commercial activities. They choose their location according to the criteria of physical accessibility and the availability of monied clients. These forms of commerce offer many advantages like a diversified, but cheap, stock of products and parking facilities. Under this pressure, shops that cannot stand the competition disappear or become increasingly specialised in certain items. Advanced telecommunications has introduced in this sector other forms of shopping alongside the most traditional ones. The result is the growth of alternative shopping modalities for clients, and the possibility for the trading sector to diversify the offer of services (Keyzers & Wagenaar, 1989; Koppelman et al., 1991; Weijers et al., 1995).

— New shopping modalities have been introduced, from television purchasing to tele-shopping. For people this means more flexibility in the choice of time. Presently the offer of products on telematics networks is still limited to certain categories of goods for certain target groups, usually the more affluent ones. The most users are people affected by time-space limitation or physical constraints.

— The potential for the growth of the market is very large. It can be expected that an ever growing number of articles and goods will be commercialised via telematics conquering a consistent share in the shopping market. However it is not likely that all kinds of goods will be purchased via telematics. For instance, perishable
goods as fresh food will be hardly dealt with telecommunications.

— Purchasing via telematics is a solution for people with a tight time-space budget, and for functional shopping. The recreational part of shopping will continue to be physically performed.

— Shops will diversify their offerings by introducing systems of on-line commerce. This will give them the possibility to deal with a large quantity of products. Each shop becomes a pole in the network.

— Some shops will only have a virtual presence. They can be like home-pages with a catalogue of products from which clients can order. They collect the orders and deliver the purchased goods at the address of the customer. A storage place is the only relevant physical requirement. Selling personnel can work from any location.

— The storage place for goods can be eventually detached from the selling place. In these cases shops may acquire more of a showcase for products.

— One advantage of the new telematics modalities can be flexibility of the delivery system. Home delivery is one solution, but other methods can be agreed between vendor and client.

These possibilities may tend towards changes in the position of shops and shopping centres in the urban area. From one side we may expect special shops to use telematics to be able to use a larger assortment of goods, and to be more spread in residential areas, taking over the traditional role of shopping centres. From the other side, shopping centres and major warehouses, which can also be accessed by telematics, will choose to locate in the most attractive places, as, for instance, city centres or easy accessible locations, to emphasise the ‘recreational dimension’ of shopping. The system will acquire a networking character, with places of commerce, storage spaces, management, clients all linked in a single telematics network. A multiple choice remains available to clients: they may physically go to the shop or access it just virtually, having the goods delivered at home or just place an order and collect it according to their time schedules. The telematics activities produced by ICT in this function are tele-shopping, tele-work, tele-information.

*Services to production* is the urban function that supports ‘production’, ‘trading’, or ‘credit and insurance’ in their functioning. It offers a variety of services, from the design of goods to strategies for their
commercialisation, from market research to opinion surveys, from employment and labour market to the financial aspects of enterprising. The main characteristic of these services is the management and production of information, and their treatment for the use of market operators. The information is gathered, controlled, analysed, and re-sold once that it is transformed into useful information for producers, firms, companies. In this way information becomes a product in itself. Other services in this area concern the selling of skill knowledge, as the management of computer networks.

The rise and the diffusion of these services are a relatively recent phenomenon. Before they were subsumed as parts of the respective functions. There were research departments, design sections, marketing and management branches and so on, which were part of factories, banks, or trading enterprises. Nowadays an ever growing number of public or private institutes and firms are giving orders for research and studies to specialised firms outside their own companies. Much of the work is performed by using applications of information and computer technologies. Tele-work, tele-information.

Credit and insurance is the urban function that deals with the management of capital and with the flow of money. It offers a broad range of services, and it can support any kind of transaction enabling movement of money.

The most conventional place for this function is the bank, which can assume different forms in relation to the services it offers to its customers. Three main functions can be recognised: credit (gathering of money and its utilisation to produce more wealth), monetary (issuing of payment means to facilitate transactions), servicing (using knowledge and equipment to assist customers’ operations) (Vanacore, 1992). By combining these three functions, banks occupy a central position in socio-economic landscape nowadays.

Credit and insurance is the urban function in which innovation in telecommunications has found a fertile ground for applications. This is because a large part of banking activities is based on the transmission of information, and the rapidity of this transmission is a basic element of competition in economic markets (Smidt et al., 1990; Vanacore, 1992).

The number of on-line services that banks offer to their clients has sharply increased in latter years. Clients can access these services from remote locations, these being either their own homes or connection points located elsewhere. These services concern the checking of bank accounts, movements of money, orders of payment, or other simple operations.

Participation in stock exchange is greatly facilitated by telecommunications. Banks, agencies, private persons can be connected in real time with stock markets all around the world and operate on these markets buying and selling shares.

In the monetary function, the use of credit cards and PIN cards is becoming very common and parallels the more traditional cheque. They support other functions in which transactions requiring movement of money may occur, as shopping. Credit cards and PIN cards can be used on almost any banking circuit in the world, completely independent from the original bank of issue. One idea being studied is to combine other different, (not exclusively banking), functions into a single smart card.

Cash dispensers are very widespread in present urban landscapes. They deliver money for daily use by introducing a PIN card into the appropriate gate. They are connected on-line with the bank for the automatic update of information. They can also supply other services such as the checking of one’s bank account.

Insurance companies also use telecommunications for their operations. Information is diffused between clients about the different possibilities to insure persons and goods. At the same time companies can access data-banks to acquire information on the applicant so far as the current law permits.

The organisation of the credit sector has already experienced relevant changes as progresses in telecommunications have been introduced. Headquarters and branch offices function as a single body supported by telematics connections. They have acquired the form of networks that also includes cash dispensers, homes of clients and major economic centres like stock markets. Investment agencies and private persons are also connected to the economic world by means of these telematics networks.
Defence and civil protection is the urban function concerned with the safety of the population as situations of potential danger for people and territory occur. It intervenes in case of war or catastrophes as earthquakes, floods, volcanic eruptions, tornadoes, and so on.

This function also performs preventive operations by investigating situations of potential risk and preparing plans of intervention for the case these situations actually happen. In line with this, they also give indications about the requisites for urban planning and control that plans and designs respect the rules of safety.

Telecommunications can find applications in this field mainly as a support for the co-ordination of actions and as most effective means for the spreading of information into the public sphere. In cases of catastrophes, this information can reach a large part of the population suggesting how to behave and, for instance, the best escape routes. The monitoring of the development of that certain situation can find in telematics an important tool to report changes speedily. This is particularly relevant when the rapidity of decision plays a fundamental role.

Personal and collective security aims to ensure the private and collective security of people. The services offered concern between the others rapid intervention in case of emergencies, control of public spaces, police investigation and crime prevention and the fight against crime. Public institutions supply most services, while the number of private institutes in this field is growing.

Technology has made great progress in this area. New methods and technologies for control and investigation have been produced, and many others are on the way. The question is in how far these technologies are a potential threat for the privacy of individuals.8 — Tele-surveillance facilitates the control of public space; alarm systems can be connected with the concerned institution (police, fire brigades, etc.) allowing a rapid intervention if needed; satellite systems and communications can help in detecting criminal behaviour.

— New technologies can be combined with telecommunications to improve investigative operations. Police forces can access national and international data-banks containing all sorts of information on crimes and criminals.

— ‘Electronic prisons’ enable the remote control of persons responsible for minor criminal acts and of people subjected to precautionary measures of freedom restriction. They can be obliged to wear a ‘electronic bracelet’ that constantly reveals their position.

For individuals and companies telematics is mainly a matter of alarm systems for ready intervention. For institutions -the suppliers of the services- there are many applications in investigation, prevention, and fight against criminality.

Management and control of habitat and environment deals with the quality of the environment by supplying ecological services. Monitoring of urban and rural areas, control of the level of different kinds of pollution over the territory, waste disposal and transformation, and others again. This function is relatively new, as the consciousness of the importance of a clean and good-preserved environment is a rather recent of contemporary societies, at least in the form we know at present.

Telematics can facilitate the diffusion of information on ecological matters and promote more environment-sound behaviours between population. This kind of education is a very important step towards a sustainable environment.

At the same time new technologies supply helpful tools for the monitoring of the environment. Computers render easier and faster the analysis and confrontation of gathered data on the state of the environment. At the level of the individual, besides a more complete information on ecological education, it is possible to record and analyse the use of energy as domestic consumption in order to adopt alternative, more environmentally sound behaviour.

Tourism and receptivity is the urban function for the organisation and management of the touristic potential of a city or a region. It promotes the value of places of
attraction, it deals with available accommodations and events, it promotes the leisure time sector for touristic purposes.

Cities and regions with touristic potential are in competition with each other to attract flows of tourists and, consequently, of capital. Tourism is a very relevant industry for many countries like Italy, Greece, or Spain, and it is an important source of profit for many other cities and regions with a national or international drawing power, like Paris, Amsterdam, London, or New York. The capacity of a territory to attract tourists may have different origins, from a developed leisure industry to artistic value, from the beauty of nature to some exotic taste of a population or a country.

Once the possibility of travelling for tourism was limited to the most wealthy or adventurous people. The traditional places of tourism, like Italian art cities or distant exotic countries like India, absorbed the greater part. Nowadays, tourism is becoming a mass phenomenon moving consistently capital funds around the world, with cities and regions competing to obtain a share of this flux. Therefore, many efforts are undertaken to acquire national and international visibility by promoting the characteristics of the area and by facilitating accessibility. Telematics networks are most important vehicles for this promoting activity.

- Information on the characteristics of a city or a region are diffused world-wide by means of virtual networks. Many cities and regions opened their sites on the Net to promote tourism in their areas. From there it is possible to get information on the place, scheduled events, the best way to go there, accommodations availability, and to book hotel rooms, flights, or to rent a car. Directly from one’s armchair.

- Travel agencies are flourishing as tourism flourishes. Their capacity to offer services to tourists, by way of the organising of travel and accommodation, guided tours, reservation of facilities, is enormously enlarged by the application of telecommunications. Telematics networks allow searching for the availability of transportation modes (flights, trains) within few minutes and allow the placing of reservations. The same holds for accommodation and special tourist packages.

- Many cities have introduced automatic information systems accessible to a large public. The places of access for these systems are strategically located. Their position is primarily in the city’s gateways: airports, railway stations, or bus stations. They are usually built as information columns or booths and make it possible to obtain information on public transportation, on hotels and accommodation or on scheduled events. They also give city plan information with the most attractive points for visitors. These systems are usually inter-active. From there people can take action such as reserving rooms or buying tickets.

- Other locations for these systems are the public spaces in the city centres or in major hotels and public buildings. From there it will be also possible to learn more about the city/region, the museums, the theatres, the restaurants. For instance, it will be possible to get information about and then make reservations for the theatre or the tennis court or for hotels or other accommodations.

- Tourist information offices will use telecommunications to co-ordinate and monitor the various on-going touristic activities in the region. They will update information in real time and suggest possibilities to their clients. A possible application is the on-line guided tour: tourists can be guided through the city or the region from a remote location making use of interactive devices as transceivers. The ‘tourism and receptivity’ urban function assumes the form of a network to facilitate the visibility, access, and use of the touristic potential of a city or a region by tourists. This network functions on several levels, from the wide international dimension to information and use of local facilities. The poles of the network are automated information and reservation points, tourist information offices, travel agencies, and people’s homes.

Culture as an urban function embraces all services directed towards the satisfaction of the cultural needs of citizens. This function is strongly connected to other functions as ‘education, training, and research’, ‘tourism and receptivity’, ‘leisure time’. The places for this function are libraries, theatres, museums, cinemas, art galleries, and so on. These places function as catalysts for the cultural interests of people. Applications of telematics in this field can improve the
accessibility of these services especially in favour of less mobile persons or people with tight time-space budgets.

— From the one side, museums, theatres, cinemas, libraries and most other cultural facilities can be visited also virtually. Indeed, many of them are building their virtual twins. These presently have, above all, an advertising function, but in the future they can become a virtual environment to welcome virtual spectators for a fee. This evolution is linked to the development of high quality video and sound technologies, and to the convergence of these technologies in a single environment of global communications.

— On the other side, telematics delivers better information on events and places. This renders possible better planning of the visit to cultural facilities as it can be associated with better information about transportation possibilities and reservation systems. Also, information about the meaning and cultural value of the event/exhibition can be more complete and easily accessible for a better preparation.

— Telematics also makes it easier to manage the artistic and cultural heritage of a nation. Databases can be created on the state and the characteristics of historical contexts, for instance, in order to better organize efforts towards preservation and maintenance, and to detect the urgency of interventions earlier. This is particularly helpful for countries with a great historical heritage such as Italy.

Telecommunications allows the possibility for cultural facilities to organise themselves into networks. In this way each place becomes a pole in the net from which to access other poles. The home can be one of these poles from whence begin virtual tours of museums or to follow thematic exhibitions independently from the physical location of the events and from opening times.

Leisure time is an urban function that is concerned with services devoted to the leisure activities of people. It covers a broad range of situations, a general distinction being between indoor and outdoor entertainment and amusement. This function has strong connections with ‘culture’ and ‘tourism and receptivity’ urban functions, and in some cases with ‘education, training and research’.

Current developments in the labour market seem to leave more free time for workers. Working times are being reduced, part-time jobs are increasing, and so are the numbers of professionals or free lance operators. Moreover, the introduction of telematics often allows the spare time needed for physical commuting and the gain of more free time by the better organizing of activities.

This availability of free time, along with the importance of leisure for people’s well-being, has motivated the development of the entertainment industry in latter decades. New technologies have multiplied allowing the media to offer more services in this sector. Improved techniques for the recording and broadcasting of events and inter-personal telecommunications offer a new potential to this industry that could give rise to an infinite number of specific applications.

— Information about events and other possibilities of entertainment are made more easily accessible via telematics networks. This can serve as an organisational support to the physical performance of leisure activities by providing information on routes and transportation possibilities, by eventually making it possible to place reservations or buy tickets and by helping in the co-ordination of multiple tasks.

— Events can be transmitted on request via telematics to the people’s homes or to other locations with suitable equipment for the payment of a fee. The ordering and receiving of a certain movie or music selection can be made from a distance.

— Interpersonal communications via telematics open up many possibilities for leisure time. Traditional spare time activities as card playing or chess games can be performed in virtual environment as well, thus diminishing physical and organisational hindrances. New possibilities of using one’s own free time are also seeing the light. This concerns computer-based games and playing, but also applications such as chat lines and discussion groups that make possible some kinds of informal conversation. Many consider Internet navigation as an amusing activity in itself.

— Another possibility for the use of one’s free time is to engage in education. This relates to several situations.
Following courses to improve knowledge on specific matters or to acquire new knowledge and skill is one possibility. Another refers to knowledge supporting other leisure activities or hobbies, like gardening or handicrafts.

— Reading a book, which is, perhaps, the most traditional leisure time activity, can be also done via telematics. One can access the catalogues of libraries no matter where they are located, and subsequently place an order or even have access to the virtual alias of the chosen book.

Leisure time is a growing market in contemporary societies. Telecommunications supports many applications in this sector, particularly people with time-space constraints or physical impairments, or with much free time will be the target of tele-entertainment services. The function will assume more and more the aspect of a network where information and events can be transmitted on individual request from one pole to another. People’s dwellings form a part of this network as major consumers of leisure services. Tele-information, video-happenings, tele-conferencing, tele-library, will be new forms of leisure activities as telematics is introduced.

Legal is the urban function that deals with the administration of justice. It is concerned with the diffusion of information about regulations and laws, and with legal proceedings. The court of justice is the traditional place of operation for this function, along with lawyers’ offices. The function has connections with ‘civil administration and management’ for that part which concerns the issue of laws, and with ‘personal and collective security’ for what concerns the investigation on crimes.

Conventionally, legal proceedings are organised in several steps before arriving at the definitive judgement. This organisation aims to ensure transparency and equity in the administration of justice, assuring the respect of the rights of investigated persons. This also means that procedures take a long time before they come to a conclusion. In many countries this process takes years and over-loads with work the institutions concerned with the administration of justice. The duration of legal proceedings can hardly be shortened since they depend strongly on legal timetables. Nevertheless, the introduction of telematics applications could be helpful to speed up some of the procedures. This applies especially to the transmission of information between the actors involved in the proceedings and to the virtual presence of investigated
persons in the court of justice. However, there are some questions of legality connected with these possibilities. Moreover, applications of telematics can make easier the diffusion of information between the workers in this sector or for the general public regarding issue of laws.

— For the workers in this sector connections with databases and tele-information systems are effective possibilities. For instance, jurisprudence about specific cases becomes more easily accessible. Problems may arise about the security and protection of some items of information.

— For the general public, legal education can be a relevant item. Information about the issuing, the meaning, and the utility of new or existing laws can improve one’s civil consciousness. Further, improving knowledge can be a way to reduce the need to appeal to the court for some controversies.

— The storage of the results of investigations and of the records of legal proceedings can be made on digital supports as well, thus reducing the dimensional needs of storage spaces and making easier the work of accessing archives.

This function can be partially re-organised according to a networking structure. The poles are the court of justice, lawyers’ offices, prisons, the homes of people interested in legal matters. They hold telematics connections for the diffusion of information and to support parts of the work of involved actors (lawyers, judges, public prosecutors) and of parts of the legal proceeding.

Transportation.

By transportation we understand a group of urban functions with a specific role in spatial arrangements. They deal with the movement of people, goods, and information in time and space. They encompass logistics (organisation and management of trips), the means of transportation and infrastructures.

People’s mobility is the urban function that deals with services supporting the mobility of citizens. It concerns different modalities of private and public transportation and the related infrastructures.

The increasing mobility of people has had a tremendous impact upon the structure of cities and regions over the last century. Firstly railways, and later the car, have increasingly diminished the importance of distance for the behaviour of people. Cities become closer, regions became smaller. Important developments took place along transportation axes and nodes. The spread of the car, especially after the ‘fordist revolution’, has favoured urban sprawl, a phenomenon of (sub) urbanisation characterised by a loose pattern of housing connected to the main centres (the location of facilities) by physical infrastructure of communication. Infrastructures have been progressively adapted according to the growing demand for mobility: new railway lines, new highways, often the doubling of the existing facilities. If the spread of the car has produced an improvement in the quality of life of many people by reducing the importance of spatial constraints to facilitate desired behaviour, the car as territorial adapter, at the same time it has had a relevant negative impact for the society as a whole. In the first place there are the ecological consequences, such as atmospheric and acoustic pollution. Secondly come the consequences in terms of increasing congestion with their related costs. Finally, urban sprawl often threatens areas that are important for the balance of local ecosystems.

The introduction of telematics in this sector aims on the one hand to give answers to these urgent problems, and on the other hand to improve the quality of life of individuals by supporting desired modalities of mobility (V&W, 1998).

— The introduction of telematics applications is expected to reduce traffic congestion by activating several mechanisms: the substitution of enforced trips by their telematics equivalents, more alternatives in the choice of the moment to travel. This could have positive effects for the environment. However, it is not clear yet if these mechanisms will have an impact upon traffic congestion. Many believe that telematics will also promote new trips, and that other travellers will occupy the space rendered available. In other words, the hidden demand could fill in the created capacity.

— Information systems are helpful for the decision about the easiest or more convenient routes to reach a destination. Available transportation means, the level of
congestion, the characteristics of the route, alternatives, the kinds of facilities along the way and estimated times. Passenger information systems also include electronic timetables and reservation systems to be accessed by telecommunications.

— The introduction of telecommunications also gives transportation firms the opportunity to better organise and manage their products. ICT has enabled more variety in the system. In addition to traditional busses, trams, and taxis, there is now a new generation of systems of demand-responsive transport, targeted more upon individual needs and which occupy an intermediate position between the bus and the taxi. Some systems plan their route according to the people to be transported, adjusting it in ‘real time’ as new reservations of trips or impediments occur. These systems are computerised.

The ‘people’s mobility’ urban function will develop towards a more efficient use of transportation facilities. Telecommunications will make an important contribution above all by rendering information easily accessible, better possibilities to plan individual travelling behaviour and better information about events, and, by supporting new transportation modalities which are more targeted on individual’s desires (Hable et al., 1996; Draijer et al., 1997; Meijkamp & Coesel, 1998; Rooij, 1998). Goods mobility concerns the organisation, management and execution of movements of goods around the world, from the places of production to the distribution points. Freight traffic makes use of different transportation means: aeroplanes, ships, trucks, train. The ‘mainports’ are the nodes from which this movement of goods is sorted out and directed towards the distribution sector.

With special concern for the transportation of goods by trucks, problems of traffic congestion are becoming urgent for both ecological and economic reasons. In this sector, telematics can help as a support to logistics. Information systems make easier the planning of routes and delivery times (V&W, 1998). Thanks to telecommunications, these plans can be modified in real time at any moment, as the circumstances require. Another relevant application under development is the above mentioned faber (see ‘production’). This will make it possible to substitute the physical delivery of some categories of goods with a virtual transmission of information.

Information mobility embraces all kinds of communication between people. The exchange of information of any nature—from social contents to practical information and business purposes—is a distinctive feature of societies.

The history of human evolution is the history of development in the ways to exchange information: from the oral culture to the chirographic one, up to the introduction of early telecommunication systems, like the telegraph, the radio, and later, the telephone and the television. The design of building and cities, the organisation of social relationships and roles, the development of culture has been deeply influenced by changing communication paradigms. Now we are entering the so-called ‘information society’ where developments in telecommunications and information technologies render possible the exchange of almost any kind of information independent of time and space constraints. The re-organisation of urban functions we are trying to summarise in this chapter is basically due to a changing possibility to exchange information.

2.2 Summary and conclusions

The relationships between the three levels of the network city model of Dupuy (1991) described in Chapter 1 Section 1.11 are crucial to the understanding of the city-telecommunications relationships. The available knowledge in this area is concentrated on the second level of this model. It concerns the trends toward the re-organisation of social and functional environments. In this chapter we have conducted a systematic exploration of these trends with the aim of pointing out the intervention of telematics applications in the related processes. In particular, we were interested in the changing relationships between the second and third level, that is the way in which people/clients access services and establish and maintain social relations. This has been expressed in terms of tele-activities. Tele-activities are the alternative to the traditional way of performing actions that are made possible by telematics. These alternatives are not a substitute for the traditional ones, but rather complementary to them. They confer more power of choice to individuals, increasing the weight of the third level in the network city model presented. The analysis of time-space
properties of tele-activities for people will give more indications of the effects of telematics in urban settings. This analysis will be the conducted in the following chapter.

Notes

2. Associazione Interessi Metropolitani, Milan. The Internet course was called ‘Internet: nonni e nipoti’ (Internet: Grandparents and Grandchildren).
4. Information from the Telematics Applications Programme site (http://www2.echo.lu/telematics/).
5. More detailed information on telematics applications and services for senior citizens will be given in Chapter 5.
http://www.dds.nl/
3. Users and Tele-activities
3.1 Tele-activities in residential areas

In the previous chapter we investigated the operators at the second level of the network city model, trying to point out their relationships with the third level of operators: the users in their daily behaviour. We maintained that these relationships can be expressed in terms of activities made possible for people by the re-organisation of social and functional domains caused by the on-going introduction of ICT. In this chapter we shall take a closer look at these activities to find out more about the effects of this ‘tele-matisation’ upon the functioning of urban services and social relationships on the spatial behaviour of people.

The previous chapter made it clear that the residential area will be one of the most challenged parts of future socio-spatial systems. Many services will be accessible to people from residential areas (home or a place nearby) via telematics connectivity. Houses and neighbourhoods will acquire a different meaning for people, as they become even more the centres of their spatial behaviour than previously. Beside the traditional interpretation of residential areas as place of consumption, these will be increasingly considered as a place of production too. The operators at the third level will choose whether to perform many activities from home and neighbourhoods or, more likely, whether to opt for a flexible combination of different locations. Here we are going to focus on the activities made possible in the residential area and their meaning for the users. The question that comes to the fore in this chapter is regarding the time and space aspects of these activities. To this end, an inventory of telematics activities will be made on the basis on the analysis carried out in the previous chapter.

The household may be defined as a relatively open system that maintains linkages with society (Presvelou 1986). This means that the relationships between household and society are characterised by a continuous series of inter-actions. The quality and the quantity of these inter-actions depend upon various factors, such as the personal history of the household, its cultural level, the legacy of tradition, the possibilities it has of interacting (in time, space and economic resources): the household receives from society different kinds of inputs, such as goods and services. These inputs are elaborated and returned to society as feedback. The relationship between household and society can be strongly influenced by telematics. Moreover, information technology is able to transfer new knowledge, new skills and aptitudes to users (Presvelou, 1986), thus being an influencing factor in this way, too.

The new activities enabled by telematics in the residential areas are called tele-activities. These tele-activities can be sub-divided into four groups, according to the function they have for the members of the households. A major criterion that can be helpful in making a distinction between groups of activities is: the measure of discretion people have in the performance of activities. In this way we can distinguish the following (Caso & Tacken, 1993):

Productive activities: these are closely related to a specific paid job that members of the household have (e.g., telework). They are influenced by the relationships between employer and employee, and they can be enabled by both a public and a private enterprise.

Domestic activities: some tele-activities have a function as part of the management of housekeeping (e.g., tele-shopping, tele-banking, household monitoring). They should be mainly enabled by a private enterprise.

Supportive activities: these tele-activities enable specific services at home. They concern activities such as tele-health care and tele-learning, which provide extra services. In principle, they should be enabled by a public enterprise but, in accordance with the trends toward deregulation, there will also be room for private initiatives.

Leisure and recreation activities: people can make a free choice to participate in services like video-games or video-events. These should be mainly enabled by private enterprises.

A similar distinction is made in the Swiss MANTO-project (Rotach & Keller, 1987; Rotach, 1988), concerning Professional (production, tele-working) and Non-professional (domestic working, leisure activities) telecommunications applications, on the basis of three scenarios of technological penetration. Also Ian Miles (1995) identifies three scenarios for the future home within the context of social, political, environmental and
technological trends: Exploded Home; Laager Mentalities; Nuclear Families. For each one he looks at the relationships with a type of household activity. Here he identifies formal (paid) work; informal (domestic) work; informal (out-of-home) work; personal care; at-home leisure; out-of-home leisure.

The distinction we operated derives from the inventory of urban functions and services carried out in the previous chapter and on the meaning of the tele-activities identified for the socio-spatial economy of the household. In this sense we believe that our distinction is more complete than those mentioned above. Let us now consider the time and space aspects of tele-activities.

3.2 Time-space effects of tele-activities

The four categories of tele-activities are characterised by time-space constraints, whose analysis is useful in understanding the effect on the action-space of the individual. Some general time-space features are common to all tele-activities. They refer to:

Time saving. Reduction of time consumption in relation to:
— the possibility of making fewer forced trips;
— improved effectiveness of the achievement due to automation of operations and quality of data.

Time choice. Some activities will be freed from the present coupling and authority constraints\(^1\), while the same constraints will change for other activities. Capability constraints will be less determinant as well.

Location choice. The relationship with some services will be less important in people’s choices. Other facilities and factors will receive greater importance. The location of the dwelling and the work location will be more independent from the length of the commuting trip. Locations will be more accessible.

Less relevance of distance. The accessibility of information will be largely improved by telematics: distance is for some services no longer relevant. Also here other elements will become more important than distance.

In general, it can be stated that telematics improve the flexibility in the use of time and space in both ways: amount and allocation.

To get more specific evaluative information on time-space effects of tele-activities in residential areas, the effects on both dimensions can be specified by using more specific parameters. Expressing the characteristics in measurable units enables comparison of tele-activities. This can contribute to a more theoretical insight. Space can be considered in terms of diffusion, location, and space consumption; while time can be regarded as frequency, points in time, and duration (Beckers & Raaijmakers, 1991).

Level of diffusion. Diffusion depends upon how many people will, or can, be expected to use the specific tele-activity, and where. It is a qualitative assessment more than a quantitative one. It indicates the expected level of performance of tele-activities: e.g. every person, group of people or those who specifically demand it. For space consumption as result of tele-activities, information about the number of users is relevant. For the level of penetration and acceptance it is more relevant to know how large is the share of actual users related to the potential users. For tele-work a realistic expectation is that a large share of workers in services and administration can participate. This is not realistic for most of the industrial workers. For tele-shopping the whole population can be the target group and it depends on the types of products whether someone prefers to shop or to tele-shop. Tele-learning can be accessible to all students or pupils at a specific level.

Location of facilities. The location indicates where the activity will be carried out. In principle, a tele-activity can be done in the home, in a group of dwellings, in a dedicated facility offered in a neighbourhood centre, or in a combination of these two locations (Caso, 1991). Furthermore, three different kinds of neighbourhood centres can be identified according to their scale of influence in the city: one neighbourhood, a group of neighbourhoods or the urban area (Caso & Tacken, 1993). For tele-work and tele-learning this whole diversity of optional places is realistic. People can work at home, or, if they prefer, work together in a particular facility. This can be induced by the need for social contacts or by the need for support. For tele-shopping the most preferred location will be probably the
dwelling. Tele-health care could refer to a combination of locations dependent on the type of health care service.

*Space consumption.* This item gives an indication of the quantity of space needed to perform the tele-activity on the basis of the space needed by each individual. It is a combination of quantitative and qualitative standards. The space needed for a tele-activity depends not only on the size of the equipment, but also on other factors like the degree of isolation and on the operations associated with the tele-activity. Tele-work and tele-learning will be activities that need a quiet environment. A separate room will be the best solution. For tele-shopping isolation is not necessary, while for video-events or computer-games people may choose to do these activities as a social event or to seek some isolation.

*Frequency.* How often will people perform the activity? This is a dimension relevant for the time-space consumption and for the effort people will make for this specific activity and for the level of acceptance of some nuisance for the user and household members. For a daily activity people will invest more effort to realise a tailor-made performing place for the activity. Frequent tele-work or tele-learning will be probably done in a dedicated place. Tele-shopping, which people do for a few minutes once a week, can be done in any place.

*Choice of the point in time.* The possibility to choose the moment to perform tele-activities is an indicator of the degree of discretion that people have in performing an activity, with special reference to coupling and authority constraints. Sometimes a strict time schedule is decisive for the activity: delivering goods by a tele-shopping service or the time of a tele-meeting. For shopping and also for working the discretion is improved by tele-services.

*Duration of tele-activity.* The amount of time spent for a tele-activity is enough information on the time consumption: the greatest part of the day, a few hours or some minutes. The time spent in performing a tele-activity is an indication of the importance of that tele-activity for the individual or the household. This can influence the choice of the place where to locate the tele-activity.

The effects mentioned before concern the temporal and spatial effects of separate tele-activities. The expectation for the future is focused on the integration of several services. Recently the integration in hardware is making progress in the development of combined equipment: computer, a printer, fax, telephone, and copier. This integration will have effects on the location choice and on the compatibility in time and place of tele-activities. This depends on the question as to whether two tele-activities can be performed by the same person or by more persons at the same time or in the same place. This information can be derived from the data mentioned before.

### 3.3 The first group of tele-activities: the productive activities

The first group of tele-activities is formed by the tele-activities related to a specific activity of households. The task of these activities is the production of a ‘good’ to inter-act with society. Most of the time this ‘good’ is information (a part of the ‘production chain’ of information that characterises the ‘informational society’). Commonly the information has to be further elaborated to obtain a final output. At other times the ‘good’ already forms the final output and is ready for introduction on the market. The kind of ‘good’ depends on the kind of work done by the households and on the relationship between employers and employees. This tele-activity is generally called ‘tele-work’ or ‘tele-commuting’, and it can involve both private and public institutions.

#### 3.3.1 Tele-work

Many factors play a role in the definition of tele-work (or tele-commuting, remote work etc.). Among the most structural characteristics Huws (1993) mentions the location, the proportion of working time, the degree of dependence of the tele-worker upon the employer, and the use of information technology. Another study stressed that organisation, location and technology are the three main concepts around which the most definitions are built (Beer & Blanc, 1985). The choice of a definition depends on which factor – or combination of factors – is considered as most important in relation to the use one wants to make of the conclusions. A more spatially oriented definition has been proposed in a monographic issue of ‘Condition of Work Digest’ (Di Martino & Wirth, 1990):
"the term 'tele-work' (or 'tele-commuting', 'remote work', 'distance work') has been used to cover a variety of situations and experiences, such as:

**Electronic home work.** This most widespread form of tele-work is performed at home, but with the use of new information and communication technologies. In comparison with traditional home work, it allows of an entirely different range of skills, forms of organisations and links with the central organisation.

**Satellite centres.** These are separate units within an enterprise, geographically removed from the central organisation but maintaining constant electronic communication.

**Neighbourhood centres.** These provide electronic facilities that are shared by different users and belong to various enterprises or independent entrepreneurs. They are located near workers' homes and can also be used for additional purposes, such as tele-education, tele-shopping or leisure activities.

**Mobile work.** Professionals whose work requires travel can use electronic communication facilities to link with their headquarters and have access to electronic mail, data-banks, etc."

Herein a distinction is made in two main types of tele-work (Di Martino & Wirth, 1990), depending on the purposes of its implementation:

— tele-work performed in a location near or in the worker's home. This form of tele-work particularly responds to the needs of disabled or home-bound workers and helps to reduce commuting (and consequently results in energy saving, reduced pollution etc.);

— tele-work performed in a business-determined location. This form of tele-work is primarily aimed at cost reductions or better servicing of the market.

The first type has a greater influence on the residential environment, since it poses the question of where to perform the tele-activity and of how to combine working and living into the same environment. In all the definitions the main discussion points concern:

— the location: only at home or done at other locations than normal;
— the relation with the employer: full-time, part-time or free lance;
— the equipment: using telecommunication or not, and, if so, using the telephone or more sophisticated communications.

In an international workshop on tele-work a definition is chosen which contains as main elements (Reisen & Tacken, 1995):

— adjustment of the work location to the individual geographical situation; resulting in shorter or fewer commuting trips;
— a relation with the organisation as (temporary) employee or partner;
— the possibility to use telecommunications for interaction.

**Tele-work, general.** Tele-work has been a subject of some research projects that have demonstrated the large number of problems and consequences related to its introduction (e.g. Ahrentzen, 1987). Many experiments have shown a substantial gain of productivity for tele-workers, owing to factors such as elimination of the stress factors of commuting, improved concentration, lack of interruption (Di Martino & Wirth, 1990). Moreover, the extra expenses for the tele-workers' facilities are generally compensated for by savings in the costs of owning a large office within a city (especially large cities).

Tele-work also offers opportunities for several types of users, such as elderly people, disabled and women with children, to earn an income while engaged in a job despite their problems. Another application for which tele-work is suitable, is related to the development of isolated regions by offering job opportunities and services to the inhabitants of these regions, such as for instance the Scandinavian experiments with the 'tele-cottage' (Bibby, 1995).

Other research projects and experiments have shown the potential of tele-work in respect to the possibility of replacing forced work mobility (Niles, 1995). The implementation of tele-work can help to reduce
3. Users and Tele-activities

commuting. It can modify the travel behaviour of workers, as shown by the experiment carried out by the Dutch Ministry of Transport (1989-1991) with 30 of its employees. An unexpected result of this experiment has been that the household members of the tele-workers also appeared to travel less than before the experiment (Hamer et al., 1991).

Another finding related to the evaluation of this tele-work experiment was that tele-workers spent only a part of their time (20%, about one day a week) on tele-working. They prefer to work in the central office for the rest of the week. This may be explained by the need to maintain traditional social contacts with colleagues.

The items linked to the working conditions of tele-workers have been a prominent subject of investigations, too. The introduction of tele-work changes the traditional work organisation of companies, and calls for skilled workers. Also the legal status of tele-workers is not always clear; they can be seen both as a part of the company (and, therefore, having a contract of employment) and as professionals producing goods for the market, at their own risk. Moreover, agreements about the general expenses for facilities and tools for tele-work are very differently regulated depending upon the company and on the tasks after introduction (Di Martino & Wirth, 1990). The salaries also are often different, in comparison both to both other tele-workers and with central office workers.

Evolution in work organisation due to telematics may also encourage the rise of new kinds of jobs and of the relationship between companies and workers. A possible trend is the setting-up of service companies formed by workers that can perform some specific tasks for firms or other companies during a certain period. This would be a type of 'employment agency' that offers facilities to specific categories of supportive personnel working for different companies, even by the same persons. It can enable great flexibility to the dimension of business firms.

*Time and space effects of tele-work.*

*Diffusion:* tele-work will be an activity especially for groups of people with particular needs and constraints, not only disabled, but also people with a great need for flexibility. Apart from these groups, other people will ask to perform tele-work particularly amongst white-collar workers: professionals, and more generally among information-related workers. With regard to the jobs that can be done by tele-work, a list of them has been made in *Electronic Service Unlimited* (Kelly, 1988), as reported by Di Martino & Wirth (1990).

*Location:* tele-work can be performed at home, in spaces shared by a small number of dwellings or in different kinds of neighbourhood centres (Caso & Tacken, 1993). The decision depends on the type of design, and on more specific needs, like the degree of privacy or isolation, social contacts, and constraints such as availability of space and an economic budget.

*Consumption:* combination of tele-work with other activities creates conflicts. It requires an isolated workspace: a room; a group of rooms; a specific building - which will enable a relevant usage of space. Some figures mention an extra requirement for 12.5 m² for each tele-work place (Vlek, 1987).

*Frequency:* tele-work can be performed daily, but a combination of tele-work and traditional work is most likely, and often requested. In a Dutch case study the frequency of tele-working has been between 20% and 40% (Hamer et al., 1991).

*Moment:* the moment in time depends on the kind of work and on the status of the tele-worker - whether he is a professional or he has a relationship with an employer. Generally speaking, more discretion and flexibility in time schedules will come about (Reisen, 1997).

*Duration:* tele-work is an activity with long duration. It involves the tele-worker for a significant part of the day.

3.4 The second group of tele-activities: domestic activities

This second group includes the tele-activities related to housekeeping (management of households). Several tele-activities can be seen as having a function as part of the activities needed for housekeeping. Usually these tele-activities can be easily combined with the traditional ones, since they have similar aims. Well-known examples are tele-shopping, tele-banking and household monitoring.
3.4.1 Tele-shopping

The definition of tele-shopping has already caused considerable discussion. If we assume that some elements are essential: two-way electronic communication with a direct involvement of supplier and consumer (Smidt & Conijn, 1989), the choice falls on the following definition:

"Tele-shopping is a personal exchange of information between a supplier and a consumer via electronic communication, in which a transaction for the supply of shopping goods comes about".

Therefore, that means that television auctions and purchasing via mail-order firms do not fall into this category, owing to the absence of any personal exchange (Tacken, 1990).

Tele-shopping, general.

Tele-shopping is expected to have significant effects upon traffic and physical planning (Smidt, 1990; Tacken, 1990, Weijers et al., 1995). In fact, shopping trips can be detached from store opening hours, and this may mean a reduction in congestion. Some of the shopping trips by consumers will be replaced by delivery trips. On the other hand, stores will have more freedom in choosing their location, being less dependent upon an expensive location in the inner city or in shopping centres. Effects upon the size and specialisation of stores may also be expected. An indirect effect will be the gain of time by users, to be invested in other activities.

The shopping process can be divided into two main categories (Salomon & Koppelman, 1988; Tacken, 1990):

— functional shopping: doing errands to provide oneself and the household with the necessary articles;
— recreational shopping: visiting shops and shopping centres is regarded primarily as a recreational activity, a means of social inter-action and broad product information without purchases always being made.

It should be clear that the intervention of telematics in the shopping process (enabling tele-shopping) has effects on the first category of shopping: functional shopping. For this category the gathering of information about prices, delivery methods and times, payment procedures, quality of the goods to be purchased is very important to enable comparisons to be made between different products offered by different shops, since the final task of this mode is the purchasing of an item. On the other hand, the category of recreational shopping offers little opportunity for the intervention of telematics, since recreational trips and curiosity about the products on offer are its main purpose: it is hardly a matter of transactions. However, a recent survey sponsored by the Danish E-commerce Association revealed that tele-shoppers only buy during 5% of the time they visit e-commerce sites. For the remaining 95%, they collect information and see what is new on offer on the web.

Tele-shopping and the shopping process.

According to Tacken (1990), shopping as a process has a few steps that determine the overall process to some extent (Salomon & Koppelman, 1988) and gives indications about the replacement of traditional shopping by tele-shopping. The main steps of this shopping process will be described. A first step is the choice of a certain way of shopping. The next important step is the acquisition of product information: physical qualities, price, possible uses etc. On the strength of this information consideration is then given to whether to purchase or to seek further. Finally, the decision is taken as to whether to enter into a purchase agreement. The last phase is obtaining the purchased item: taking it away, collecting it, having it delivered.

How should we place tele-shopping against the background of the shopping process and product differentiation? The first step in the shopping process already makes a choice immediately necessary: how to shop? The choice may fall, among others, on a specialist store, supermarket, shopping centres, mail-order business or tele-shopping. The nature of the product to be bought will certainly play a part in this.

For tele-shopping the usual division into speciality goods, shopping goods and convenience goods is less important than distinction by the degree of freshness and uniqueness of the article. It is to be expected that the purchase of unique, perishable products certainly will not be done via tele-shopping. Besides the nature of the product, the product information, the comparison etc. the following factors will be important in the decision to tele-shop: the
accessibility of the shopping facilities, the available time, how and when the goods ordered will be received. This information comes up above all in the following phases of the shopping process: the choice of the way of shopping and the delivery of the purchases. Here the elements of time and space come to the fore. These are two dimensions that are important to the users.

The users of tele-shopping.
With regard to the profile of the tele-shopper, some categories of people seem more involved than others, in particular women and people with mobility problems, and young couples with a shortage of time. A postal survey conducted in Amstelveen (NL) (Keyzers & Wagenaar, 1989) showed the composition of the users:

— elderly persons living on their own, whose children have left home and who generally do not work (any longer)
— young couples (married or living together) up to the age of 40, both of whom work and many of whom have
— young children
— young working single persons
— the traditional households.

The rationale of these groups for performing tele-shopping is generally related to the lack of time and to mobility problems. It is possible to assume that the young people often have to contend with a lack of time for doing their shopping alongside their work within the limited opening hours of stores. Among the elderly the absence of a car and the physical limitations of poor health will play a part.

One aspect that seems to facilitate the spread of tele-shopping is the introduction of the smart card and of the electronic reader for payment. Paltz (1988) mentions the credit card as a means of facilitating remote transactions. Smidt (1990) asserts that tele-shopping could be promoted by the introduction of electronic banking. Another element of some relevance is the educational level; that is fairly high for tele-shoppers, and usually includes some previous experience with computer equipment. The main factor impeding tele-shopping is the non-physical presence of the goods. Some pros and cons of tele-shopping, both for consumers and suppliers, have already been listed (Tacken, 1990). They include:

consumer's side
for
buying at home
home delivery
time-saving
consultation with family visit
no fixed opening hours
product information at home
specific approach

against
not seeing the goods oneself
expensive equipment
no social contact in store
no change of scene by visiting a store
no direct demonstration
higher prices
invasion of privacy

supplier's side
for
no store space
introduction of new formula
no shoplifting

against
long working hours
hardly any impulse buying
more transport and logistics

In this survey of pros and cons the effect on time and space can be clearly recognised.

The case-study in Amstelveen (Keyzers & Wagenaar, 1989) already mentioned has shown a shift in the behaviour of people in the use of space. They hardly buy fresh products via tele-shopping, but they prefer to go to speciality shops, whereas before the introduction they were used to going to the supermarket. This probably could have effects on the nature and size of supermarkets in the longer term.

The same survey also shows some interesting features about the use of time. Half of the users tele-shop once a week or once every two weeks, while a large percentage (40%) do so only once a month. Orders by the tele-shopper are placed in the morning and at lunch time (35%) and some in the evening (33%). Young people, many of whom work, use the evenings more for ordering. Delivery of the shopping takes place in nearly half the cases in the evening (6 to 9 p.m.) and then mostly to young people. During the day the other half of the orders are delivered, more commonly to among the elderly.

Time and space effects of tele-shopping.
Diffusion: it can be expected that tele-shopping will be performed primarily by people with specific constraints. This especially holds true for the substitution of functional shopping regarding products that do not need to be physically checked in order to make a choice. But, everyone can participate in it.
Location: tele-shopping can be done through ‘home access’ and ‘public access’ systems (Smidt, 1990). The ‘public access’ can be a shopping machine installed in shopping areas or neighbourhood centres. This system would better match certain groups of users that have plenty of time, but problems over mobility in medium and long distances. The ‘home access’ tele-shopping will be done at home and this will ask for specific delivery measures (Caso, 1991). This last facility will be the most common variant, since in this way people have most to gain from the service.

Consumption: both systems will evoke minimum space consumption. A place for the equipment and for the delivering of goods will be the only demand for space.

Frequency: the frequency of the action will be freed from constraints. Since research has shown that the purchase of fresh goods will be hardly made by telematics (Keyzers & Wagenaar, 1989), a weekly or even monthly frequency may become the most usual option.

Moment: the choice of the moment in time should be agreed with the supplier, but it is likely that more freedom will come about. The tele-shopper creates a new constraint in his fixed time schedule for delivery. Authority constraints will continue to play their role, while coupling constraints will be far looser than presently. This will increase the discretion of the purchaser.

Duration: tele-shopping will generally take little time. This especially applies to the public access system. With the home access system people may spend more time for consultations and agreements.

3.4.2 Tele-banking
It is not easy to define tele-banking because of the broad range of situations it covers. But, some features may be assumed to be essential: two-way communication and the bridging of physical distances by an electronic network. A definition of tele-banking could be: “Tele-banking is any application of telecommunication and information technology that:
— involves a personal exchange of information between bank (or any related institution) and bank-user (active use);
— enables control of the transaction by users;
— is independent of distance.”

This means that we can regard the tele-banking activity in two different ways.

— On the one hand, it enables the user to check his bank account and to optimise the use of his money, for instance by choosing better investment modes or by performing Stock Exchange operations.

— On the other hand, it is a supporting activity for many other activities, such as tele-shopping or tele-homework. Activities often require a money transaction, that can be made by tele-banking (e.g., via a smart card).

Tele-banking, general.
Banking activities have been among the first sectors that have experienced the implementation of telematics applications. Indeed, banking activities are particularly suitable for management by telematics since they are usually based on the transfer of information. The flow of information can replace the physical flow of money, and be used in all economic operations that usually do not involve the physical movement of goods (e.g., Stock Exchange operations).

The spread and use of credit cards, PIN cards and smart cards is maybe the most evident expression of the impact of tele-banking systems in contemporary societies. Users of these systems can be supported in almost any kind of transaction enabling movement of money and they can more easily maintain control of their banking operations by checking at any moment their accounts. The liberating power of these systems for individual behaviour is also shown by the possibility of using them almost regardless of national boundaries. Indeed, PIN cards and credit cards can be used in almost every country of the world, while information on personal banking situations can be obtained through telematics networks independently from the position of the user.

On another level of application, people can use telematics to access economic environments as stock markets regardless of distance and at any time. The only requirement is, of course, to comply with the rules of this market. Playing in the stock market can in this way become either a ‘hobby’ or eventually a secondary way to earn money alongside a regular job.
Concerning social categories most appealed to by tele-banking there is no limitation, although elderly people may encounter more difficulties in dealing with codes and pass-words, or adapting their mentality to the use of new technologies. However, these systems are very simple and adaptation does not usually present particular problems. Moreover, elderly people are among the categories that can enjoy rather more the safety of these new systems, since physical money can still mean in some environments a danger to the person carrying it.

**Time and space effects of tele-banking.**

Diffusion: systems based on telematics applications for the banking sector are quite widely spread in modern cities. Cash dispenser and electronic payment systems are nowadays very common. Many banks offer their clients on-line services to be accessed via telephone or via computer connections. The spread of these systems is steady growing. For other applications, like the participation in stock exchange markets, the spread will be limited.

Location: tele-banking can also be performed through ‘home access’ and ‘public access’ systems. The first modality offers more privacy and concentration. It is, therefore, suited to private purposes or activities which require isolation and concentration, or that take more time. The second modality will be located at the level of the neighbourhood and the urban area, and will offer supporting services as cash withdrawal and other simpler and rapid operations.

Consumption: space consumption will be small. Both at home or in the public environment the tele-banking systems will need minimum space, as a PC at home or a booth in the streets. In this second case, some extra requirements concerning safety may have influence on the consumption of space.

Frequency: frequency depends on the kind of activity. Buying and paying with electronic money can be a daily activity. Checking of bank account and ordering/performing some operations are more likely done once a week or on monthly basis. The frequency of the performance of other activities is more discretionary.

Moment: there is more freedom about the choice of the precise moment to engage in tele-banking. Since these systems are usually fully automated, all activities can be done at any time regardless of the opening hours of the physical offices. Participating in the stock exchange depends on the times of the markets, but the possibility of bridging distances make it possible to be connected to markets according to the time zone.

**Duration:** usually tele-banking takes few minutes. More complex activities may take more time but, except for the fanatic or one who works in the sector, this will not occupy a large part of the day.

### 3.4.3 Household monitoring

Household monitoring relates to:

“those applications of information and computer technologies that make it possible to optimise and control the working of residential buildings (both dwellings and neighbourhood centres) or residential areas in general”.

The main applications are usually connected with the safety of the environment, by detecting gas, smoke or fire, or unwanted intrusions (burglary). Warnings to specialised intervention bodies (fire brigade, police) can be done automatically by electronic networks.

Other applications are concerned with the monitoring of in-home comfort and of energy consumption, by means of sensors that enable users to create their own climatic conditions in their living (working) environment. Some applications have shown a large saving of energy by using computerised tools to detect and eliminate waste of energy.

Smart home technologies combined with applications of ICT make it possible to steer the functioning of the house from afar. This has several advantages for the users, as the possibility to keep an eye on the house, the facilitation of some tasks of care-giving, the gaining of time in a series of household tasks as cooking, washing, drying.

**Effects on time and space.**

These kinds of devices are usually completely automated and do not require any other intervention by the users. No significant effects can be expected on the
use of time such as the frequency, the amount of time and the moment.

For the use of space (diffusion, location, and consumption) we also cannot see any significant effect. However, some effects on the size of rooms and other parts of the dwellings (e.g., windows) can be foreseen, since the optimisation of the energy functioning of buildings makes them less dependent on the climatic factors. These kinds of effects are beyond the scope of this report.

3.5 The third group of tele-activities: the supportive activities

The tele-activities belonging to the third group are the tele-activities that can supply some extra services to the household. They are supportive activities for households with specific needs that need some continuity. Activities like tele-health care and tele-learning can be considered supportive. By their social dimensions, it may be expected that these activities will primarily be introduced and managed by public institutions. However, trends towards de-regulation allow private initiatives.

3.5.1 Tele-health care

The term health care is used here in its broadest sense, covering all the services offered by ‘Medical Prevention and Health Care’ as an urban function. Thus, prevention as well as cure is included. In a broad sense, tele-health care refers to:

"those applications of information and tele-communication technology to services of prevention and cure that permit the remote utilisation of different specialisation by an active inter-action between a demander (people) and a supplier (hospitals or any related institution)".

As for the other tele-activities, two-way communication and the bridging of physical distances by electronic networks are essential features.

3.5.1.1 Tele-health care, general.

As already remarked (Cullen & Moran, 1991), the shift towards an 'ecological' view of health enables the idea of health to be broadened to include social services and quality of life aspects. In this sense the creation of a 'Community Care Context' should be seen as the spread of services in urban areas. In this regard, broader possibilities of application are expected from telematics. Applications of telematics to health care are interesting subjects of research projects, especially in relation to specific target groups.

Tele-health care can play a key role in medical assistance for particular groups of people, such as the elderly and disabled, by facilitating the continuous assistance of qualified medical professionals.

Another interesting field of application for tele-health care is the role it can play for a better servicing of rural and isolated regions, in which the availability of physical medical facilities is often extremely difficult.

Moreover, the introduction of tele-health care on a large scale should lead to an improvement of the diffusion of health care in urban areas in a more efficacious way than at present, as it allows the bridging of spatial and temporal constraints. One aspect of this growing diffusion is related to the spread of medical services of prevention, in which the diffusion of information is an important feature.

Prevention and cure.

Generally speaking two main sections can be distinguished in the whole tele-health care activity: prevention and cure services.

Prevention services. There is a large measure of agreement on the necessity to increase the supply of prevention services to the population. Prevention is better than cure: it is healthier and it is also cheaper. Two kinds of prevention services can be distinguished:

— prevention by information. The distribution of information can have a preventive function by giving indications about what to do in illness or in potential danger, or also only to improve one's own (medical) education. This kind of service can be supplied on request or on government initiative. The diffusion of medical information can also stimulate self-care activity by people: in this case the information must be carefully checked before it is supplied.
— preventive care. The applications of telematics in the field of preventive care mainly relate to the supply of information and the remote utilisation of different specialisation. Annually recurring diseases, problems deriving from pregnancy, spread of epidemics can be preventively faced to avoid the risk of their occurrence. The spread of neighbourhood health centres that telematics may enable and better servicing of information can improve the use of preventive care.

Cure services. For the cure services the remote utilisation of different specialisation enabled by telematics can lead to a spread of these services in urban areas. Telematics can have an important role in the supplying of medical assistance to particular groups of people such as the elderly or disabled. Their physical conditions can be continuously kept under control via on-line connection with health care centres or with the main hospitals.

Home-care.
Particularly interesting are the possibilities for telematics applications in implementing the ‘home-care’ option. In Dutch social policy home-care is stressed as an important way to assure enough care for specific categories such as the elderly, disabled and terminal patients in the longer term.

A reason for this policy is the rapidly increasing amount of money needed for care in institutional or intra-mural services. Another reason is the increasing number of people needing more help, but who want to stay at home independently and to get the care they need from people they know, like relatives or neighbours. A third reason is the changing position of women — traditionally carers — in the labour market. Women, too, are participating more in paid jobs and they receive more education. This rising educational level results in a decreasing interest in jobs with low payment and low social ranking in nursing homes and hospitals. They want a more flexible work pattern that enables a combination of work with child rearing and house-keeping. This means a greater flexibility in time and space. A final reason is the demographic development. Since the post-war baby boom the birth rate has sharply decreased and that means for the coming decades that the active part of the population will decrease while, at the same time, there will be an increasing number of elderly people.

Against this background the growing interest in home care and the use of technology is understandable. This policy is re-enforced by the desire of most people to stay at home and to have more privacy, even in situations needing increasing care, both supported by needs for independence and self-determination (Cullen & Moran, 1991). These needs can result in a situation in which some people prefer more technology for medical and daily support, partly supportive for helping relatives, friends and neighbours, and fewer professional workers.

Technology as substitution and supplement.
Diepen & Fokkema (1990), as well as Cullen & Moran (1991) have stressed the interest in technology in the home as a substitute for personal care. Alarm systems are installed in many homes to give people “a greater flexibility, reassurance, mobility, increased range, and safety” (Cullen & Moran, 1991). These alarms can be upgraded with some other features, and they can be integrated with other devices like a passive alarm, or a certain way of monitoring: intruders alarm, room temperature, cookers, running taps and many others. These systems can even be connected to expert systems and databases with on-line computers to give specific information and support needed by medical personnel.

Tele-control and monitoring of domestic equipment is possible (Diepen & Fokkema, 1990) which gives people with handicaps or the elderly the opportunity of an independent and self-supportive life in their own home. Diepen & Fokkema (1990) expect more remote active care in a combination of surveillance and monitoring.

Effects of tele-health care on time and space.
Diffusion: tele-health care is intended to be an activity for people who have health problems, such as disabled, elderly or patients in the longer term, and who need to be continuously kept under control. At the same time, a better spread of the health care function in the city can be achieved by means of telematics applications. Excluded are those people who regularly need very specialised assistance, care or instruments, but a large proportion of people can make use of this service. For prevention the whole population can be the target group.

Location: the location of this tele-health care is important. Two main solutions can be distinguished:
at home: nursing and care can be brought to the home. Parts of these functions can be substituted by telematics.

dedicated health centre: part of the nursing and care can be de-centralised into smaller centres near people's dwellings to support the neighbourhood population with health care services or more specialised care or measuring instruments.

Consumption: tele-health care at home will require a part of a room to host the necessary equipment. Sufficient space will also be necessary in the neighbourhood centre.

Frequency: tele-health care will be used more frequently, compared to the current situation, allowing the possibility of increasing preventive activity and the improved diffusion of the service. Home users will have a frequent relationship with this activity, while the neighbourhood centre will improve the accessibility of health services with the result of being more frequently visited.

Moment: the choice of the time will be freed from constraints of distance and transport availability. Coupling constraints like the working hours of carers and the opening hours of medical services also become less determinant for the choice of the moment of performance.

Duration: the increasing frequency of performance and the improved accessibility will have effects on the duration and type of the activity. It can be expected that the total amount of time spent in tele-health care contacts will decrease, while the duration of each interaction will be shorter than now. A shift in the level of support can be expected: more preventive contacts in the first line and fewer time-consuming contacts on the more specialised level.

3.5.2 Tele-learning

The term tele-learning (or tele-education) can refer to:

"those applications of telecommunication and information technologies by means of which a remote personal exchange of information between educational staff (teachers and the like) and students is enabled".

Therefore, the features of tele-learning are:
— the bridging of physical distances by electronic networks;
— the two-way communication link.

Which means that the use of advanced tools of education cannot be defined per se as tele-learning, since this is not performed in on-line mode or does not involve any active personal participation of teachers and students.

Tele-learning, general.

The educational field offers far-reaching possibilities for the application of telematics. Since educational activities are characterised by processes of communication and information, telematics can provide alternative tools for enlarging the range of communication and information media. Applications of telematics to educational activities have been focused primarily on the higher education system, but one can expect further applications in lower educational systems.

Several advantages derived from application of tele-learning have already been listed (Jankowski & Wolf, 1988). They include:

— open and increased accessibility of information;
— enrichment of facilities available for communication;
— promotion of social contacts, possibly to a point where little or no difference between face-to-face and mediated communication exists;
— promotion of time and site independence for the student;
— accessibility of advanced knowledge;
— easy and quick updating of knowledge.

To these advantages, others can be added, partly derived from the list and partly from possible expectations. By promoting time and site independence, tele-learning can help in reducing traffic in peak hours: it should be encouraged by government organisations (local and national) as a strategic method of reducing congestion in urban areas (Prinssen & Kropman, 1992).

Tele-learning can be regarded in itself as a powerful educational means, stimulating the transfer of new skills and knowledge to its users. This point is very important as we enter the informational society.
The service of educational facilities can be improved by tele-learning in isolated and rural regions. In some Australian regions, for instance, a form of radio-learning is already used, to cope with the enormous distances of that continent. Here the adoption of tele-learning can improve the spread of educational services.

Another question can be related to the promotion of social contacts. A charge often made against telematics is related to the fear that this development does not allow the individual to live in a free and dignified way, reducing or even denying social relationships. This fear is clearly unjustified. Telematics does not have simple substitution effects, but it is complementary to more physical relationships. Tele-learning can help to create the awareness that can lead to enrichment of social life, increasing the differing means of inter-action.

Tele-learning can also help in supplying educational services to specific groups of people with problems of time (working students), health (disabled), or movement (elderly). A large spread of tele-learning can stimulate people to improve their educational level, by means of a better service of educational programmes.

Several forms of tele-learning have been introduced in the Netherlands. Parts of the former correspondence courses are taught using computers or, more simply, telephone connections. The same situation has been created for education by the Open University. The Dutch Ministry of Transport has conducted an experimental project for tele-learning for students of a high-level vocational school. In this project students learn and do homework by computer during part of the day to avoid peak-hour traffic, especially in public transport.

*Tele-learning and the educational process.*
In general terms, an educational process consists of four steps strictly related to each other.

— The first phase is the communication or the supply of information from teacher to student. A certain amount of knowledge is transferred to the student who should in turn learn it.

— The second phase is the discussion of the knowledge. Here the student can express his doubts and problems, and the teacher is able to elucidate.

— The third phase is the application of the knowledge. The student (or the group of students) should practise this knowledge by means of exercises.

— The fourth phase of the educational process is the check on the exercises performed. Corrections, suggestions, discussion and further explanation follow.

For this work the question is the position and the role of telematics in this general process. It should be clear that each of the four phases is based on a transmission of information by personal exchanges. The possible application of telematics in the educational process can be clearly recognised. It can consist of a partial, or even complete, replacement of face-to-face communication by electronic networks, for teaching, practice, checking or discussion.

It has already been noted (Wolf, 1988) that the shift from a computer-supported education to electronic network education implies the extension of the inter-action from a student-machine inter-action to student-teacher interaction via the machine. This is the same argument stressed by Petrella (1988) to show the effects of the introduction of Minitel in France. It can also be noted that the shift from inter-activity to communication using advanced electronic devices can open up a most interesting field of investigation for designers and planners, in which the spatial meaning of this shift is the key issue (Caso, 1991).

**Effects of tele-learning on time and space.**
*Diffusion:* tele-learning can be especially attractive to students of higher schools and universities. For students at lower schools the diffusion will be smaller since, at this level, the function of social aggregation of schools is very important for the development of personality. Another target group will be formed by people with an educational demand who wish to improve their knowledge and have time and motivation to do so. Retired persons as an example. Tele-learning can be an indispensable support for the education of disabled students who experience difficulties in physically reaching the school.

*Location:* two locations are possible for the performance of tele-learning. At home or in a centre of education. This second possibility is more appropriate for certain
kinds of activities. It permits social exchange with other users and the sharing of some facilities. The home option will most likely be used for learning activities requiring isolation and concentration.

**Consumption:** the home option requires some space consumption, as a part of a room should be devoted to tele-learning when this activity is performed regularly. The education centre will be equipped with rooms for different functions for small groups of students, space for facilities and will have supporting personnel.

**Frequency:** tele-learning needs a daily or weekly schedule (timetable), depending upon the target group and on the its purpose.

**Moment:** some parts of the learning process are linked to the on-line availability of a counterpart, such as a teacher or an expert. In these cases the choice of the moment is fixed. Other activities are freer, as the access is to recorded information/lectures or to certain facilities. In general tele-learning allows more flexibility to the user.

**Duration:** tele-learning is an activity that occupies a large part of the day.

3.6 The fourth group of tele-activities: leisure and recreational activities

The fourth and last group of tele-activities consists of activities to be performed in leisure and recreational time.

The introduction of telematics on a large scale can have effects on the use of time. One of these effects is the time saved (mostly owing to the replacement of forced trips). The increased availability of time can stimulate the other (tele-) activities, with the consequent demand for new spaces. The time saved by the adoption of telematics applications can stimulate people to other productive, domestic, supportive, or leisure activities. As well as more traditional (outdoor) activities, some growth in the market of telematics leisure activities can be expected. Here people will make the discretionary choice whether to participate in leisure tele-activities or to opt for other kinds of activities. The potential number of leisure tele-activities is enormous: almost every kind of game playing could be done by computer, alone or with others, no matter where located. At the same time receiving entertainment programmes will be facilitated by telematics.

The application of telematics to leisure and recreational activities can give rise to a broad range of tele-activities. It may be expected that private companies will supply them. One important feature of these activities is free choice for the people who may decide to take part in them. Only a few leisure tele-activities will be described here. This is just to show the potential of this group of activities. A complete assessment of the state of the art in this field is impossible.

3.6.1 Video-events

One leisure tele-activity can be enabled by the possibility of remote participation in events held all over the world. This participation will be active or passive in line with the kind of event.

The idea of the video-event is based on a hypothesis of development in the leisure and recreational services market. We may expect that the organisation of large and medium-sized events (concerts, meetings, conferences, sporting events and so on) will take into account the possibility of supplying them all over the world to everyone, who will pay for delivery to their screen (for instance, using a smart card or via tele-banking). Video-events can also be seen as a supportive activity for many others, while supplying educational programs or enabling remote work meetings.

The impact of this activity on the expenditure of time can not be estimated, since people make a free choice to participate in it or to use their spare time in different ways. This will not depend on the average behaviour of categories of people, but on their personal behaviour. However, the choice of the time will be fixed by the supplier, since he must set a starting point for the event. At the same time, more discretion is available to the user as the same event can be also recorded and received off-line.

The influence on the use of space: participation in the event will be less dependent upon distance or its location. This may lead to a new demand for spaces to receive video-events, which may influence the spatial behaviour of people.
3.6.2 Other leisure tele-activities

The number of tele-activities for leisure time is potentially huge.

People can think of replacing some leisure activities by telematics versions of them. For instance, chess games (and the like) can be played by remote communication via computer. An advantage can be the possibility entering a large network of players that is independent of distance. The increased number of potential opponents will give players the possibility of a free choice of the time of playing.

The spread of 'role-playing' originated by the Anglo-Saxon 'fantasy' literature (see for instance the work of J.J.R. Tolkien and the role-playing Dungeons and Dragons) is reaching every country in the world. Those playing can find in electronic networking a powerful supportive tool. As is well known, usually the goal of this kind of playing is to succeed in ideally carrying out an 'adventure', by interpreting the role of characters of fixed behaviour. These kinds of games are usually not competitive, and they are performed in groups. The mechanism of the role-playing is based on the communication of information about the player's position and action or reaction to some situation. Some simplified versions of role-playing are already available on computers for solitary use. The shift towards communication person-to-person via interactive machines can enable several players to play by co-operating on a network. In this way these kinds of leisure activities will be less dependent upon time and space constraints.

Other applications can be related to cultural activities. The connection with cultural poles, as for instance museums or archaeological sites, can be used to enrich one's own knowledge and to plan leisure time trips.

Listening to music or watching a movie are also possible with the aid of telematics. One can order by one's own computer a certain selection of music or a specific movie and it can be delivered at the stipulated time on one's screen or loudspeakers. Payment can be made via smart card or tele-banking.

The effects of this sample of leisure tele-activity on the use of time and space can be clearly recognised. They will influence both the choice of the point in time and the duration, as well as the point in space (location) and distance.

Time-space effects of leisure tele-activities in general
Diffusion: only those who specifically wish to will do these activities in their own home. Related to the growing market for video and computer games a large share of the population can be a consumer of these facilities.

Location: the homes of clients and the neighbourhood centre. In a home the place may be located in its collective sphere and/or its personal sphere, according to the user(s). A position in a neighbourhood centre may also be expected, especially for wider interest events. In this case it will be a place for a group of neighbourhoods, or, better if it will in connection with other activities as tele-conferencing or local interest major events.

Consumption: little space is needed in a home for these activities, while a demand may arise concerning the organisation of the collective sphere of the house where a more flexible configuration will be requested to match the need of more collective activities in the same time and place. A large space will be reserved in the neighbourhood centre for these activities, that will be the same space used for other large interest tele-activities.

Frequency: every day some free time is available, but it is doubtful that this time will always be spent in leisure tele-activities. A combination with other (outdoor) leisure activities will be more likely. However, the frequency of leisure tele-activities will be a discretionary matter.

Moment: for some leisure activities the choice of the point in time will be discretionary, and will depend on coupling constraints. For other activities authority constraints will remain the most important.

Duration: according to the kind of leisure activity a medium or short duration can be expected. If the development goes further in the line of multimedia equipment this could be totally different. The same equipment will be used for music, video and leisure activities. Together these activities use a lot of time.
3.7 Other tele-activities

Some tele-activities can be seen as belonging to each of the four groups described above because they are supportive to the other tele-activities, while others have little application in residential areas and can therefore be considered to be beyond the scope of this work.

Moreover, the field of potential applications of telematics is too broad for a complete analysis. Therefore, only the most important tele-activities (important in relation to their effects on the use of both time and space) have been described. In this section a further sample of tele-activities will be briefly presented, with their effects on time and space.

3.7.1 Tele-library
Tele-library is an activity that can belong simultaneously to different groups of tele-activities. An electronic network would connect libraries throughout the world. People can use one entry to this network to enter the services. In this way the reading of books, or the consultation of lists of books, will also be possible from home. One advantage is the vastly increased possibility of choice. One can look for books in every library connected to the network, and the distance will be unimportant.

It is easy to see the different possibilities for this tele-activity. It can be a supportive activity for specific jobs, for instance, those linked to the training and research activities, and, therefore, belonging to the first group. Tele-library can be used by students to support their educational activity and tele-learning (third group). Likewise, it is a leisure and recreational activity (fourth group), since reading a book is one of the most usual ways of spending one’s spare time.

The effects on the use of time vary with the task. One general effect can be stated: there is a major freedom in the choice of the point in time. Entering the services will not be linked to the opening hours of libraries. Also, the amount of time will be influenced by tele-library, resulting in the saving of time because of the replacement of home-library trips by remote communication and because of the saving in delivery time. On the other hand, the improved comfort enabled by the telematisation of the services may cause an increase in the number of inter-actions.

The introduction of tele-library on a large scale may have effects on the use of space too. A diminishing number of reading rooms in libraries may be expected. The location of libraries will depend less upon their accessibility. The consumption of space in residential areas will depend on the tasks of the tele-library. For applications related to a job, some specific tools will probably be needed. In accordance with this, space will be provided for each home, or a common space can be shared by several workplaces when these are located in tele-centres.

For leisure time applications, part of the dwellings can be arranged as a telematics library, when this activity is recognised by the user as important for his own leisure time. Otherwise, the activity can be located in another quiet part of the house, but in accordance with its compatibility with other activities. Ergonomic constraints for the reading space can be an item of particular importance in the design of tele-library places.

3.7.2 Tele-information and Connections with Data Banks
These tele-activities may be regarded as a part of every other tele-activity, since the transmission of information is the distinctive feature of telematics services.

Some tele-information services can be useful in themselves. Examples are tele-information services supplying indications of routes and public transport, of telephone subscribers, of TV programmes, of timetables, of the opening hours of pharmacies, and many others. In general, the effects of tele-information and connection with data bank activity on the use of both time and space are the same as the tele-activity described.

3.7.3 E-mail services
The E-mail service enables the exchange of messages (text) between computers, even if they have a different architecture. It is usually based on a network with several ‘gates’ (input and output). The message can be exchanged from a private computer to another one via the standardisation network, or from a private computer to the main computer at an institution.

The sending of messages (text, data, letters, drawings and so on) can be separated from the opening hours of postal offices or other ‘sending’ services. The messages can be exchanged in real time from computer to
computer (also via modem + telephone network), resulting in a saving of time. Also the quality of the message is improved by using this mean of transmission (compared to the fax-transmission). E-mail services like ‘Hotmail’ are located on the Internet and are therefore accessible from any location in the world via a password. The advantage is that one can check and receive/send messages from any place in the world, the only condition is to have access to Internet. Your physical address becomes irrelevant for this activity.

Physical proximity is influenced by E-mail services. The delivery time of messages depends no longer on the distance, and this may have effects on the location of urban services.

Increasingly popular are the services of ‘instant messaging’ as those ones provided by Mirabilis with its ICQ. These services are very flexible and encompass in one software several possibilities like e-mail, instant messages, chat lines, file exchange, URL exchange, and so on.

3.7.4 Tele-conferencing
The services of tele-conferencing are mostly used for business or educational purposes or for political or scientific meetings. They enable remote visual communication alongside text and data communication. This means that a specific infrastructure is needed to guarantee the necessary quality of the transmission.

The adoption of tele-conferencing has effects on the use of space. By enabling remote visual communication (two-way communication) the location of meetings is less dependent upon their physical accessibility. Distance will be no longer an influencing factor in taking part in meetings.

A particular form of tele-conferencing is the video-telephone, which can be very useful in supporting social communication for people with time-space constraints, particularly the disabled or home-bound.

Chat lines and discussion groups mainly have a social relevance. They can be considered as services of tele-conference as well, even if the inter-action between participants happens via written texts. They help to keep contacts with other more or less known persons. These systems are usually more anonymous: they do not reveal the face of the participants and often even not their real name. Nicknames are used instead, which may give to these systems a more playful meaning. Participants can choose to dress in the clothes of any feature they like, and can act consequently. In Mitchell’s book (1995) there is a significant caricature stating: “on the Internet nobody knows you’re a dog!”.

In residential areas tele-conferencing should have little application. Some categories of people may need to use the service, and consequently they may ask for special infrastructure to improve the quality of the visual transmission. With concern to chat lines, participation in discussion groups, and the alike, a connection to Internet renders them available as a complementary tool to communicate with other people located elsewhere. It will, therefore, be an individual decision whether to make use of these possibilities or not.

3.8 Summary and conclusions
This Chapter investigated the time-space aspects of tele-activities for people. The spatial focus for the analysis has been residential areas. The tele-activities taken into consideration come from the inventory of social and functional aspects of city-telecommunications relationships that we carried out in the previous Chapter.

The analysis conducted in this Chapter made clear the variety of time-space aspects that are associated to the introduction of tele-activities in residential areas. These time (frequency, moment, and duration) and space (diffusion, location, and consumption) aspects have the potential to change the meaning of residential areas for people, making of neighbourhoods and houses the centre of spatial behaviour of individuals even more than it was before.

But, what does this actually mean for spatial settlements to introduce tele-activities? Which physical characteristics are important to facilitate the performing of tele-activities for people? How should we design socio-spatial settings in which telematics is correctly introduced? These questions will find an answer in the next Chapter, where we will try to bring together the
results of the investigation we conducted in the second and third chapters in order to suggest possible design solutions. In other words, after having investigated the second and the third level of the network city model, we will focus on the first level to try to establish connections with the changing situations we detected.

Notes

1. Capability, coupling, and authority constraints are the three categories of constraints limiting the time-space behaviour of individuals in their daily life (according to Hägerstrand, 1970).

4. Design Issues
4.1 Design issues

After having analysed the potential changes at the second and third level of operators of the network city model, this chapter will focus on the aspects related to the possible changes at the first level: the physical component of the socio-spatial system. These aspects are design issues because design is the principal activity in the process of transformation of the physical environment.

Design is essentially composition, which involves two aspects: spatial organisation, and physical form. In our opinion, aspects related to the influence of telematics applications for the design of future socio-spatial settings refer mainly to the first aspect. Therefore, matters of physical form will not be considered here. The information gathered in the previous two chapters can be considered as data that the designer should interpret and manage in order to create a new or alternative organisation of spaces, which is able to respond to the changing situation produced by advances in telecommunications and information technologies. In other words, this information gives new inputs to functional programmes that are introduced at the different scales of building programmes by means of design. To this end, the time and space aspects of tele-activities that we discussed in the previous chapter make important indications.

In particular, the investigation of the effects of tele-activities on space has made it evident that the introduction of telematics applications in residential areas will imply a growth in the demand for space. As a number of new possibilities can be associated with the residential area, new ideas and concepts have to be developed to organise these possibilities and to avoid the uncontrolled and undesired growth in the demand for space, which it is hardly possible to meet in the already congested and dense contemporary cities.

This is essentially a design question that shows both a quantitative and qualitative face. How much extra space is needed to host the new tele-activities and how can the existing spaces be re-organised to maintain this demand within acceptable limits? Which new relationships between spaces should be investigated in order to facilitate the realisation of the advantages of telematics applications without having to pay the costs of a growth in congestion and density? Dwellings and areas that abound in space will have less difficulty welcoming the new activities, but the small, 'social' houses and areas will experience more problems that may turn out to be one driving force of polarisation.

The consumption of space to allow performing all these new tele-activities will affect residential areas in two ways:

— by having effects on the internal organisation and on the size of dwellings;
— through the concentration of more tele-activities in one physical place in the neighbourhood.

It has already been remarked (Presvelou, 1986) that all the various activities inside the dwelling require a suitable and permanent place for equipment, possibly even a separate room. Adaptation of the electrical and cable systems to suit the equipment may in turn lead to re-allocation of space. All these changes are probably affected by the user's perception of:
— the relationships to interactive devices;
— the function of the room chosen for them.

For the residential settlement at least three places (apart from the dwelling) can be considered for location of tele-activities. These places are different kinds of neighbourhood tele-centres. We can distinguish three main types of centres:

— Specialised Building. The centre as a part of a large company or government service: de-centralisation of a specific service, a regional office or a local annex.
— Multipurpose Building. The centre as a cluster of different firms, which use the same building and some common services like a canteen or technical and administrative personnel. This kind of centre also can house less businesslike facilities.
— Supportive Building. The centre as a location especially for public-interest tele-activities: businesslike activities should not be housed in this type of centre.

In the following pages we are going to analyse the design items related to the introduction of telematics applications. At first we shall consider the tele-activities separately, then we shall try to assemble the effects at the different scales of design.
4.1.2 Some general aspects
Space consumption associated with the performance of tele-activities in residential areas and their possible location in relation to the dwellings of people are basic to the consideration of the design of residential settings.

There is no doubt that a major space consumption will be realised by the introduction of tele-work. The demand for a work place in the dwelling that is clearly separated from the housekeeping activities, will lead to a greater demand for houses with a spare room. In addition, this spare room should have specific characteristics related to accessibility from the outer environment and to relationships with traditional living activities. In a publication of the Dutch Ministry of Housing and Spatial Planning (Vlek, 1987) the comment is made that the gain in physical space and overhead costs in office buildings due to the decentralisation of a number of work places will be compensated by the space and costs generated by tele-work.

All in all, on a macro level it is likely that no gain in space will be made, and a part of the space designated for housing will be changed to host work activities. A question is whether the present housing stock is suitable for the large-scale introduction of tele-work. This question is not so easy to answer with the lack of research on this subject. First results (Vries, 1991) show that tele-work is mostly done by workers with a higher social and educational level. In the Dutch situation the housing occupied by this category is better than average. On the other hand, assignment of housing is often based on criteria that allow for a spare room. This means that some households have a room for extra activities like hobbies, or for guests. This room is often available for new activities like tele-work.

Permanent applications of tele-health care services will probably give reason for altering space consumption. Those services will be provided for people with special needs (e.g. disabled). These applications will need space almost solely devoted to the housing of the necessary machines. This space will be within the personal sphere of the people concerned, who will need to move their traditional activities to other places in the house. In this case the spare room that is often available will be devoted to traditional activities. This can cause problems of adaptation.

In this chapter some hypotheses will be given about the usage of available space in houses and in neighbourhood tele-centres, and the need for more and specific space for tele-activities. For each tele-activity a general assessment of space consumption will be made and, where possible, some general dimensions will be given. This will be made in relation to the space consumption by the necessary equipment associated in its use. A location in relation to the traditional spheres of the housekeeping will be described, while for the neighbourhood centre an environment for the tele-activities will be a hypothesis. When important, a description of extra equipment will be given.

As to the basic equipment needed to perform every type of tele-activity, the most simple system is formed by a personal computer (PC) + modem + telephone line, or any other information transmission network. A common desk or table should be sufficient for the physical location of these tools. Some tele-activities may need specific equipment. According to the features of the tele-activity concerned the position of the equipment as a whole will be subject to change. Requirements of isolation, concentration and privacy and the relation with the traditional activities in the dwellings have effects on the position and the layout of the telematics places. Characteristics like noise, warmth, view and comfort (both from the equipment and the relation with housekeeping activities) have to be considered along with influencing factors.

4.2 Design issues of tele-activities
The following sections will describe some design issues associated with the introduction of single tele-activities in residential areas.

4.2.1 Tele-work
Nilles (et al. 1976) first described the development of the organisation of the economic structures of firms and companies in relation to the introduction of telecommunications. He foresaw the evolution from a centralised organisation to a diffuse one, passing from the stages of 'fragmentation' and 'dispersion'. In a first stage of this evolution, he argued that the shift from a
centralised organisation of work, based upon a concentration of facilities and workers in a specific location, into a fragmented organisation, in which some parts of the main company were detached. The stage of the dispersed organisation enables the creation of satellite centres for the workers, thus isolating the headquarters of the company. The final stage, that of the diffuse organisation enables a combination of satellite centres and tele-homeworkers, connected to the central headquarters by means of two-way telecommunications links and telecommunications switching centres (fig. 1). Advances in ICT make possible this evolution: they influence the spatial organisation of work activities (location of working places) to be supported by the creation of new physical structures.

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Electronic homework (the most widespread form of tele-work) enables one to spend more time inside the home, and consequently to meet the needs of specific categories of people, as, for instance, women with children, the elderly or the disabled. Furthermore, it gives tele-workers the possibility of reconciling their family responsibilities or lifestyles with earning income. Enabling more concentration on work, it may lead towards an improving productivity by the tele-worker. This form of tele-work enables more flexibility in choosing the performing time (in off-line mode). On the other hand, it could cause feelings of isolation, since this different way of working is not supported by some alternative social work relationships. As already stated, research projects have shown that tele-workers prefer to work at home for only a part of the time (approx. 20%), using the central office for the rest of the working time. The legal status of tele-workers concerned with electronic homework is closer to that of a professional who is operating on a free market than to a traditional employee. Therefore, a widespread implementation of this form of tele-work depends on a major deregulation in companies’ organisation.

With regard to the effects of this form of tele-work on the design of dwellings, a research project has shown the need for the tele-workers to have a tele-work place in the home that should be seen as clearly separated from the living domain (Moran & Cullen, 1990). A room in the house with easy access from the outside would be suitable for this kind of tele-work (Moran & Cullen, 1990; Caso, 1991). Another solution would be to have a group of rooms or a larger tele-work room for a number of houses that is located in a separate building and that could be shared by more than one user (4 - 6). In this way it should be possible to reduce both the
management costs (by sharing some facilities) and the building costs (see figures 2 and 3).

The idea of a group of rooms separated by the main body of the houses is a halfway solution between the single tele-work place inside the house and the neighbourhood tele-centre (fig. 4). The inhabitants of a residential settlement would use this one which could also house other (telematics) facilities for the neighbourhood. A disadvantage of this form of tele-work is that it may allow less flexibility in the choice of working time than electronic homework, and that it could be less feasible for some categories of people in comparison to other modalities. By enabling more social contacts than in the case of electronic homework, this tele-work modality could become more attractive for tele-workers, because it avoids the feeling of isolation. At the same time its location (very close to the tele-worker’s house) makes it possible to keep the advantages deriving from decentralised work (for both employers and employees). Another advantage of the neighbourhood centre form of tele-work is the possibility of a further reduction in management and building costs, because this solution enables people to tele-work as both professionals and employees. In fact, we can see the neighbourhood centre as shared by several enterprises offering a tele-work place to their employees, or we can see it as an additional space that the tele-worker can buy or rent to perform professional work. Here we can expect building companies to build neighbourhood centres for sale or to rent spaces for tele-work to enterprises or entrepreneurs. This possible evolution should be regulated or (at least) controlled through a series of guidelines to guarantee the quality of tele-work performing places.

The satellite centres or branch offices are particular kinds of neighbourhood centres that are owned by single enterprises (fig. 5). Consequently the legal status of tele-workers concerned with this form of tele-work is that of employees. Thus, its users will be employees of a specific company, perhaps in a residential area in which a large number of the dwellers are traditionally employed in that company. This form of tele-work usually gives less flexibility to the tele-workers as regards the choice of their working time than in the electronic homework and of the neighbourhood centre. According to its position inside the settlement (whether it is a part of the residential area or not), a satellite centre can also house several (telematics) facilities for the neighbourhood. Some kind of agreement should be made between enterprises and public authorities to guarantee the supply of common interest services to the neighbourhood residents. For this form of tele-work too, the introduction of some regulations or controlling procedures for their dimensions and layout may be envisaged.

Mobile work (fig. 6) has tasks completely different from the other three, not aiming to reduce commuting but, on the contrary, to facilitate it. The mobile workers of a
company (the so-called networkmen) can enjoy telecommunications to perform their work tasks maintaining constant connections with their headquarters. This form of tele-work could enable physical changes in the design and lay-out of particular places like hotel rooms, congress centres, waiting spaces of transportation nodes (like airports, for instance), or major telematics centres with guest rooms. In most of the cases it complements other modalities of (tele-) work.

Tele-work is the tele-activity with most space consumption and a major impact on the relation with the traditional activities of housekeeping. A number of guidelines and suggestions are already available. They mostly concern the importance of a clearly separate nucleus for tele-work, even with a separate and recognisable entrance, to reduce as much as possible the unwanted relationship with the housekeeping.
Moran & Cullen (1990) in particular, stress the position of the work place in the dwelling as the most important: it should be made to minimise visual, auditory and physical access to the private area of the residence, and avoid design features that can afford callers or people passing-by visual access to the tele-worker. To this end, the availability of a toilet and a waiting space for work-related visitors inside the work place should be ensured for the tele-workers. Particular attention should be devoted to the position of printer(s), whose noise

**Relationship to External Environment**

— When the scale of teleworking arrangement is large and when clients call to the teleworker's home on frequent basis:

provide a separate entrance to the workspace clearly identifiable from the domestic entrance while maintaining the morphology of the dwelling;

provide a balance in form and image between workplace and dwelling which is sensitive to its environmental context.

— When a separate entrance is architecturally difficult to establish or considered to be unnecessary, position the workspace in order to minimise visual, auditory and physical access to the private areas of the residence (e.g. a location near the front door will minimise callers crossing or viewing into residence and will facilitate the reception of deliveries).

— Afford the teleworker visual access to day-to-day activities by positioning the workspace (most likely to the front of the dwelling) so that it relates to the public environment outside the dwelling. Avoid to design features which afford callers or people passing-by visual access to the teleworker.

— Provide discreet but visible signage.

— Provide a covered entrance area to facilitate transfer to/from wheelchair from/to car. (Wheelchair users interviewed noted that this transfer could take up to five minutes and was particularly difficult in inclement weather in the absence of an appropriately sheltered entrance).

**Layout and Adjacencies within the Dwelling**

— Provide an architecturally enclosed workspace – preferably a separated workroom which is used solely for work; obtain the desired level of visual, auditory, and physical separation from living spaces. In situations where a separate room is not available the teleworker will need to consider establishing privacy through other means e.g. erecting physical barriers, establishing social rules regarding the use of space, time scheduling etc.

— Provide a reception-display, waiting area which is part of the work area (and is not part of the private circulation within the residence).

— Design or adapt space and choose furniture and fittings to communicate the image desired e.g. high-tech business, office environment etc.

— Provide a toilet proximate to the work area for use to by the disabled teleworker.

**Workstation Ergonomics, Luminous and Thermal Environment**

— Create an ergonomically satisfactory workstation design; refer to established guidelines and consider special needs.

— Choice of the equipment and peripherals should be informed by any special needs the teleworker may have; adaptations if required should be put in place at the onset of telework.

— Choose and position printer(s) to minimise noise; provide acoustic hoods if necessary.

— Allow free wheelchair access to worksurfaces, particularly when upper body movement / forward reach is restricted.

— Position and choose controls, plugs, sockets, window and door handles etc. for easy reach and operation.
Telecommunications

— The number and type of telecommunications lines required will depend on the type and scale of telework undertaken. Research in the area consistently highlights work-related, social and familial problems associated with inadequate provision of lines. On-line teleworkers may require a number of dedicated data lines (e.g. data-transmission, fax etc.). In addition, where such lines are in constant use throughout the workday, at least one telephone line for work-related voice communication is essential.

— A separate telephone for receiving and making social calls (which can be shared with other household members) is considered desirable by most teleworkers. Consideration should be given to the location of this telephone. Many teleworkers prefer the non-work, social telephone to be located in domestic space, outside auditory reach of the workspace.

— For disabled teleworkers who may have difficulty reaching the telephone before it rings off, consideration should be given to installing a number of outlets in convenient locations or to providing cordless and/or hand free sets.

— Provision of an answering machine confers a number of advantages to the teleworker. It confers privacy by controlling access. It can minimise intrusion of work-related calls into living time and can confer freedom to leave the house without fear of missing important business calls. The decision to invest in an answering machine or service will depend on the scale and type of telework engaged in, the individual teleworkers' use of home, their workpatterns and those of their clients.

Storage and Security

— Provide adequate storage for work-related materials.

— Provide fire proof and lock up storage for sensitive documents, when appropriate.

— Position screens etc. to avoid affording callers visual access to sensitive material.

should be minimised as much as possible. Another important item is related to the availability and number of telecommunication lines. Apart from the quality of the lines used for telematics communication (it should be dependent upon the kind of work), at least one telephone line solely devoted to work-related voice communication is essential. The provision of a fax and of an answering machine can be particularly important for tele-workers. The investigation of Moran & Cullen also shows the position of screens is important to avoid affording visitors visual access to sensitive material (see box 1). In the already mentioned tele-work experiment by the Dutch Ministry of Transport special attention is given to the fitting up and furnishing of the workplace. Depending on the personality of the workers a location has been chosen, where he can work in a quiet atmosphere and be able to concentrate. This place needs a permanent character and a certain degree of protection against intrusion of housekeeping activities. To carry out the experiment, a special telephone connection was installed. The possibility for tele-conferencing by telephone was created. The other technical equipment consisted of a computer with a communication modem and a matrix printer. A fax was situated in the work place. These criteria and the equipment have some effects on the space consumption in home. In a publication by the Dutch Ministry of Housing and Physical Planning (Vlek,1987) figures are mentioned for the space needed for workplaces. Based on the space needed for workplaces in office buildings the surface for a work place at home is 10.5 m², with an additional 2m² for the technical equipment. More detailed standards for the work with screens are available. The EEC and the Dutch Ministry for Social Affairs have published norms for the layout of workplaces with computers and screens. When tele-work is performed in a neighbourhood centre, secondary spaces needed for toilets, canteens meeting rooms and other places that can be shared by more tele-workers. This can result in saving space and money, and in a better, more motivating, social environment.
4.2.2 Tele-shopping
Two possible locations for tele-shopping have been suggested. Tele-shopping could be done through 'home access' or 'public access' systems (Smidt, 1990). The design consequences of these two ways of tele-shopping are discussed below.

— The home access system presents many advantages, and it will meet a broad range of needs. It saves time by not being constrained by store opening hours and by the related trips (the goods are delivered to the home). Also it gives the possibility of better information on the characteristics of the goods by facilitating their evaluation.

- From the supplier's point of view possible advantages include: no need for expensive shopping floor space and no problem of shoplifting (Smidt, 1990). In turn there may be problems of security regarding the transmission and processing of sensitive material (credit card numbers etc.). There is no need for periodical refitting of shop furniture, but the virtual sales point will need regular updating.
- On the consumers' side, the disadvantages are mainly related to the cost of the necessary equipment and to the non-physical presence of the goods. Another impeding factor could be the choice of the correct location of the equipment in the house, when it is possible to find a place for it. The introduction of an interactive machine into the dwelling environment may, in fact, cause problems for privacy.

— The public access system could be formed by a kind of shopping machine, to be installed in shopping areas or in neighbourhood centres (when these two locations are different places). One advantage of this way of tele-shopping is that the user does not have to buy any expensive equipment, while a disadvantage could be the lack of favourable conditions for choosing and evaluating different products. This method of tele-shopping involves trips to the public access point, but this can be part of a multiple-purpose shopping trip (Smidt, 1990). This method would better match certain groups of users that have plenty of time, but problems over mobility on medium and long distances (for instance elderly people).

Tele-shopping (fig. 7) will need medium space consumption. Besides the common equipment one needs some space for the activities depending on its use, such as the storage of catalogues, brochures etc., or the physical space needed for writing or examining the different buying possibilities (alone or discussing it with the other members of the family). Other additional equipment consists of a smart card reader for the payment of the purchased goods. Future evolution can enable the support of more sophisticated equipment for the simulation of e.g. touching or tasting, for more detailed telematics description of goods.

Concerning the location of the tele-shopping activity inside the house (home access), there is no need for a place with specific characteristics. It should be located...
in the collective sphere of the house, there where it does not interfere with the activities of others and can be easily accessible to each member of the household.

Another design aspect of tele-shopping is related to the delivery access point for receiving the ordered goods. This will have influence on size, layout and position of the house entrance. A separate entrance for the deliverer is not necessary. The position of the entrance should minimise the visual and auditory perception of the domestic spaces, but this is valid for most usage of the entrance door. The problem of receipt of the ordered goods at home, even during the absence of the householders, can be solved by introducing a place that is accessible to the deliverer via specific codes. To better preserve the safety of the home, this space should be separated from the main part of the dwelling (Caso, 1991).

Tele-shopping as public access system can be done by a shopping machine. This consists of a screen with a keyboard and an electronic reader for smart cards. The whole shopping machine would have the dimensions of a public telephone booth. Through this machine goods are chosen from a shopping list containing all the necessary information. Then the name of the client with the address is entered and the payment is made using a smart card. The comparison of different products is already supposed to have been made at home, where any decision is made. This means that the space consumption needed for tele-shopping in public areas or neighbourhood centres only depends on the dimensions of the shopping machines: no extra space is needed.

4.2.3 Tele-banking
Like tele-shopping, also tele-banking can be performed by 'public access' points or by 'home access' points. The choice of the preferred mode depends on the type of tele-banking and on its purposes, but the private character of the transaction will probably lead to a preference for home access.

— The 'home access' point is particularly suitable for the 'active use' of tele-banking, because this takes concentration and more time. To check one's bank account does not need particular attention or isolation, but for Stock Exchange operations (or similar) one may look for specific spatial and environmental requirements.

— The 'public access' point can better be used for cash money. However, this can also give other information related to (e.g.) the bank account. The public access point can be built as a cash dispenser. To date, Automatic Telling machines (ATM’s) have already been installed in practically every bank, often linking different banks to international networks. This service has already detached some banking activities from the closing hours of banks. Even during opening hours, this public access point has many advantages, by saving the consumers long queues at the counters. The demand will probably grow to locate cash dispensers in residential areas. In this case, they could be situated in a neighbourhood tele-centre.

Two different parts can be distinguished in tele-banking. They concern tele-banking information and tele-banking business. The space consumption needed for these two tele-activities in the dwelling will be minimal for tele-banking information, and medium for tele-banking business.

— tele-banking information in the 'home access' modality can be done with the basic equipment: no other extra space or special equipment is needed. Information about one's own bank account and related services is the only aim. No extra privacy or isolation is necessary to use it inside the dwelling, and it is a service for each member of the family. However, this tele-activity will never be carried out in a group, because it is a personal service. The best location can be found both in the private or collective spheres. In particular, with a location in the collective sphere a certain degree of separation from the traditional activities is envisaged, since the interaction can raise problems for privacy. This comment can be applied to every tele-activity introduced within environment of the dwelling.

Tele-banking information in a 'public access' modality, as in a neighbourhood tele-centre, requires privacy. To obtain this, it is sufficient to avoid visual access to private information by considering the position of the equipment in relation to visual axis. The dimension of these machines will be more or less that of a common public telephone booth.
tele-banking business will need some privacy and concentration both in home and in a more public environment. The performer of this activity may need some extra space to collect supporting information and materials such as Stock Exchange bulletins or other tools that can be useful. Apart from the basic equipment, he may need at least a printer and a fax. This equipment can be the same as for tele-work, when the same person performs these activities. Otherwise a demand for an extra communication line might rise. An empty desk and some wallboards may be useful. The location for this activity in the dwelling can the private sphere of the user, or in a spare room.

In a ‘public access’ system the best location would be a neighbourhood tele-centre, where a small room with some of privacy and isolation and with the necessary equipment should be available. Users could rent these rooms for fixed periods. Some utilities can be shared as a common space with an adequate number of fax machines and printers.

4.2.4 Household monitoring
Activities of household monitoring supported by applications of telematics do not usually have a significant impact on space, at least as we consider the associated actions performed by users. Indeed they usually do not require any intervention since these systems work automatically. Once they have been installed and regulated, they only need to be periodically checked or re-adjusted in relation to changing circumstances. Despite this, it is possible to find the location of the household monitoring tools.

— Inside the dwelling, their main position should be near the ordinary meters, with output and interaction points in the different rooms of the house.
— On the neighbourhood scale, a host computer should be located in a neighbourhood centre, monitoring all the different parts of the residential settlement. Thus, it is possible to have only one central point tele-connecting the residential settlement with the urban area.

All the different technical aspects of the functioning of the house can be optimised. The general structure is based on a system that shows any anomaly in the house and that warns both users and/or concerned intervention bodies (e.g. fire brigade, police etc.). The work can be done by any computer in the house, connected with a unit that can be housed at the physical location of the ordinary meters.

A host computer located in the neighbourhood centre can control all the computerised Housing Monitory systems. This host can control both the neighbourhood centre and all the houses in the neighbourhood, by monitoring and managing each kind of communication inside the residential settlement and the functioning of each single dwelling. A room not accessible to the public has to be found in the neighbourhood centre for the host computer.

4.2.5 Tele-health care
In residential areas there are two possible locations to realise facilities for the performance of tele-health care: a neighbourhood tele-centre and the dwellings of those people concerned (fig. 8).

— The health care neighbourhood tele-centre can be either a specialised building or a part of a more general neighbourhood tele-centre, when the latter is a multi-purpose or a supportive building. It could house a first aid surgery and a small operating room for emergencies. Electronic devices for the remote utilisation of the medical knowledge of the main hospitals and a pharmacy are standard equipment in these centres. According to the number of users, it is also possible to locate within the centre a few rooms for night assistance.

— The supply of tele-health care straight to the dwelling environment is a solution particularly suitable for specific groups of users, as for example elderly people and disabled. This fits well into the Dutch social policy, in which homecare is considered an important option regarding assistance to the specific groups of people. A spatial solution for the dwelling would be to have an adaptable spatial structure, in which is possible to find a place for the electronic equipment when it is needed.

The small medical centre located in the neighbourhood will have direct connections to the major hospitals and to experts, to create direct access to specific skills and specialist service for 24 hours a day. This health care tele-centre could be an intermediate level in health care networks linking (the dwellings of) patients to major
knowledge centres. The system can improve the diffusion of health care more efficaciously than the current one. It enables good access to medical advice and care with an important saving on payments for medical assistance.

As described in the previous chapter, tele-health care can be divided into three parts: prevention information, preventive care, cure services.

— Tele-health care prevention information needs a minimum of space, both in the dwelling and in neighbourhood centre. The basic equipment is sufficient for this tele-activity. Maybe a more sophisticated screen or a connection with a TV or a videotape recorder would be helpful. The location in the house can be found in the supporting collective sphere. In the neighbourhood centre the correct location would be the waiting room of the healthcare centre, or an information point.

— Preventive care should be enabled in the houses of specific people, who are very prone to seasonal diseases. It consists of the basic equipment, plus some other machines specialised in checking and detecting the signs of periodic illness. Therefore, it needs medium space consumption: a part of a room. This space should be found in the private sphere of the user.

In neighbourhood centres, the activity can be undertaken in the healthcare centre. The dimension for this space depends upon the type of centre (multi-purpose or specialised) and consequently on the part of the urban area covered by the service. The Supportive type of neighbourhood centre will house only some facilities in a small space, leaving the preventive care to other centres.

— Also the cure services will be enabled in the houses of specific categories of people like the disabled or elderly. The space consumption will be high, because a large part of the private sphere of the user will be used to locate the machines. This will mean that a part of the traditional activities in the private sphere will be relocated in other spaces in the house. A demand for adaptation of the space in the dwelling will arise with the request for the major specialisation of spaces. For the cure services in the neighbourhood centre, the same as procedure as above for the preventive care would be repeated. In a supportive neighbourhood centre will be space for first aid services and few other facilities.

4.2.6 Tele-learning
Two locations can host applications of tele-learning in its many possible variants (fig. 9). In accordance with factors such as the group of users and the part of the educational process performed with the help of telematics applications we can distinguish between an educational tele-centre and home learning.

— Home learning finds its location inside the dwelling. It could be a preferred solution for some categories of people with mobility problems or time-space constraints, like disabled people or students who are employed as workers. It is an attractive possibility also for people who want to get some extra education. For those with fewer constraints home learning supported by telematics applications depends more upon the kind
of operation to be performed within the educational process.

— Educational tele-centres should be located at the neighbourhood level. These can be either a specialised building or a part of a neighbourhood tele-centre, say, a multi-purpose or a supportive type. The learning activities to be performed in an educational tele-centre will refer preferably to group activities involving social exchange and to those areas needing more sophisticated equipment. They should be accessible to any category of users, from students to retired persons, and offer a good level of flexibility in time.

In the previous chapter we have subdivided the educational process into five different steps. Each of them can be supported by applications of telematics for a remote performance. These steps concern live communication, recorded communication, discussion, application, and check. The spatial consumption of these activities and the implications for the design of both locations could be different.

— Tele-learning live communication, together with tele-learning discussion and tele-learning checking, is likely to be supplied only to the houses of specific categories of people. The activities need medium space. Apart from the basic equipment, one may need an empty desk and space for the storage of books, study material, etc. Utilities for the remote communication with the suppliers of the tele-learning services will be a part of the equipment. High quality screens and systems for voice and video communication (where the common computer screen and telephone line are considered insufficient) may request high quality communication lines. A printer could be an optional tool that many will demand. The location of this equipment and the physical space to use it will be found in the private sphere of the user. A demand for redesign within the private sphere will arise. When more than one person in the same household is tele-learning, it is possible to have a space that is shared and also where some utilities can be shared. The same equipment should be available in the neighbourhood centre, where students can rent some small rooms for tele-learning. These rooms also can house more students at the same time, because privacy is not a distinctive feature of this tele-activity. Dependent of the levels of concentration, the number of tele-learners in one room should not be more than four to six. A specific space/room can house some equipment (e.g. printers) that each tele-learner can use. In major neighbourhood centres as multi-purpose and specialised, more space can be devoted to tele-learning with meeting spaces and laboratories, and with supportive technical and administrative personnel.

— The tele-learning recorded communication and tele-learning application will not be services for exclusive use by specific categories of people. The one can ask for the delivery of a service (recorded communication) and
have the other one already built into his own home (application of acquired knowledge). In both cases a medium space will be needed. In the case of recorded communication, a demand for a higher quality of screens and for a videotape recorder may arise. A printer will be the extra equipment that tele-learning may require. Also for these tele-activities, the location in the private sphere of the user or in an extra space shared by more tele-learners can be expected.

The introduction of these tele-activities in neighbourhood centres will be performed in the same places of the other tele-activities of the tele-learning group.

4.2.7 Video events
In the previous chapter we discussed the potentialities of telematics in the leisure sector. We selected a few examples from the many possibilities made available. Receiving video events is one of these possibilities that can have an effect upon the design of residential areas.

— Receiving video events inside the dwelling will require the availability of some specific characteristics. The most suitable position is the same as for televisions, thus, in the collective living sphere. In accordance with individual tastes, a second possibility is to locate it in the personal living sphere of household members.

— It can be useful to provide a place in the neighbourhood where happenings of interest to a wider public can be received. This can be a neighbourhood tele-centre, where a space can be equipped with the necessary machines. This space should have the size of a small cinema.

Video events will require little space consumption in the house. The equipment will consist of a high quality screen for a better reception of the images, and of an electronic smart card reader to pay for the service. This equipment will replace the present television sets, particularly in relation to developments such as the pay-per-view television programmes. Located in the collective living sphere of the house, this activity will have a meaning for the whole household. However, it would be better to try to design spatial organisation of the collective space that allows the performance of other activities besides video events.

For video events enjoyed by a single member of the household, or if more privacy is requested, the private living sphere will be suitable. In this case, some space should be made available to place the equipment. It must be commented again that this tele-activity, like all other leisure tele-activities, will be available only to clients who will buy the necessary equipment and will pay for the special connections needed. Indeed, the receiving of video events will require high quality transmission networks.

In a neighbourhood tele-centre the receiving of video events can allow two possibilities dependent upon the number of spectators.

— Some rooms with equipment can be rented to people for individual use. Also larger rooms for small groups of people can be made available, when the video event has some common interest. In this way it will be possible to share the costs of the service and to save on equipment.

— When the video event is likely to have a very large public (e.g. special sport or music event, or more public occasions), a larger hall or auditorium is needed in which the transmission can be received. The participants will pay the cost of these events. A neighbourhood tele-centre should, therefore, be equipped with such a space. In some cases this space (or a second one) can be also located outdoors.

4.2.8 Other leisure activities
The broad range of activities made possible by telematics in the leisure and amusement sector makes it impossible to suggest a sole location for these tele-activities. However, the private character of most leisure tele-activities better suggests a place inside the dwelling and in the personal living sphere. Here a minimum space consumption can be expected: the equipment usually needed for these tele-activities is the same as for other kinds of tele-activities, and leisure is often an alternative to the performing of productive or supportive activities.

The neighbourhood tele-centre could be another location for leisure tele-activities as it allows savings on costs and equipment. Different sized rooms can be made available with the necessary equipment to experience leisure tele-activities in small groups or individually.
Moreover, telematics supply information support for the performing of physical leisure activities (fig. 10).

4.2.9 Tele-library
Tele-library may have different functions for different people. As a leisure activity or as a supporting activity to other functions, like work or learning. Location and space consumption vary according to its function.

— Tele-library work and tele-library education are functionally related to tele-work and tele-learning. Consequently, they will have the same place as these tele-activities in the dwelling. The space consumption in the house will be minimal: the equipment will be the same as for the related tele-activities. Only a high-quality printer may be the extra equipment needed in specific cases, or a high-quality screen. Also in the neighbourhood tele-centres tele-library will be performed in the same location as the related tele-activities. Therefore, no extra space will be needed.

— For tele-library leisure activities, space consumption in the house will be on a medium scale. The introduction of tele-library leisure activities may need a separate space in the collective living sphere of the house. This space may be found by re-organising the collective sphere or by adding a new space to the house. The equipment needed consists only of the basic equipment, but items such as ergonomics and comfort may suggest the adoption of sophisticated versions of the same equipment. A special high-quality printer may be needed in some cases. However, tele-library may need a connection to a high-quality transmission network. The tele-library service in neighbourhood centres will be supplied in small, equipped rooms, where one can read quietly and with concentration. Another possibility is larger rooms equipped with desks and special screens, as a substitute for a reading room of a traditional library.

4.2.10 Tele-information
— Tele-information will be built into each household. It will create the possibility of receiving information services. The basic equipment is sufficient: therefore, it will need minimum space consumption in the house. No extra space or equipment is needed. Usually it does not require any privacy or concentration, and it can be undertaken from any computer.

— As a general location, the collective living sphere of the house would be the most suitable one for specific applications.
In neighbourhood centres it can be supplied on machines consisting of a screen, a keyboard and a small printer. The size of this machine can be the same as a common public telephone booth.

4.2.11 E-mail
E-mail needs minimum space consumption in the dwelling. It can be carried out with the basic equipment, and without any other extra equipment or space consumption. It can be located in the collective supporting sphere of the house and it will be accessible via a specific secret code, or via the personal computers of individuals.

The residents of a neighbourhood can also receive their post delivered by the host computer of the neighbourhood centre. In this case they can use a computer of the neighbourhood centre, connected to a printer of medium quality to access their mailboxes. This operation may need some degree of privacy. It should be sufficient to avoid visual access to screens by others.

The services of 'instant messaging' are usually very personal. They should be located within the personal computers of household members, if any. Otherwise, a central computer in the dwelling can be an alternative if provided with the necessary privacy.

4.2.12 Tele-conferencing
Tele-conferencing makes possible virtual meetings in cyberspace. Several applications can be thought of for this activity, which differ in their size and purposes of performance.

Some people may request services of tele-conferencing as an aid to their work. This can be realised in the same space as tele-work. However, the consumption of space will be medium, in line with the quality of the transmission and with a suitable background for the images. Using a special screen and a special camera for the transmission will attain a better quality of transmission. This equipment may need to be supported by a high-quality transmission network. For these tasks, facilities for tele-conferencing can be located upon request into the dwellings of concerned people or in a neighbourhood tele-centre.

In the first case someone may like to have a particular background, perhaps with a logo etc., during the transmission. This can lead to the permanent furnishing of a corner of the tele-work place, enabling some other qualities of space.

In the second case the neighbourhood tele-centre should be equipped in order to meet different possibilities. People who occasionally need tele-conferencing may ask for a small, equipped room. Larger rooms should be available to allow the participation of small groups of people. Major neighbourhood tele-centres could be provided with a larger space (a hall or a small auditorium) to make possible the remote participation of larger meetings for a greater number of people. In this case the space consumption will be high.

Other applications of tele-conferencing have a more social relevance. This is the case for the video-telephone, which can help in establishing visual and voice contact between people. The homebound or people with problems of mobility form a category of users for whom this tele-activity can be appealing. The preferred location for this activity is, therefore, the dwelling, probably in the collective living sphere. The necessary equipment will take the place of the more traditional telephone. Another version of video-telephone can be realised via a computer with a camera and a microphone, as in the tele-conferencing systems described above. This can be located either in the collective living sphere or the personal sphere of the household.

Chat lines and discussion groups also have a social relevance. The most suitable location for these applications is probably the collective living sphere of the household, but they can be accessed from any computer. A small room in the neighbourhood tele-centre can be used for these activities, which have mainly a recreational meaning for people.

4.3 Design aspects at different scales
The previous part of this chapter focused on the design aspects related to the introduction of tele-activities in residential areas. Until now, these aspects have been considered separately, taking one single tele-activity at a time. In particular, we hypothesised some items of
space consumption and location related to tele-activities in the home and in the public environment of residential areas. In the latter case the location of tele-activities was found very often in a neighbourhood tele-centre. In the following we want to try to assemble these single design aspects in order to obtain more general indications for the design of socio-spatial settlements at different territorial scales.

The relationship between physical places and virtual spaces can be grouped in four general categories. Graham & Marvin (1996) have pointed them out as ‘physical and developmental synergies’; ‘substitution effects’; ‘generation effects’; ‘enhancement effects’ (see fig. 11). This typology is useful to show the dynamic interplay between cities and telecommunications that stresses once again the complexity of the items related to the introduction of telematics in urban settlements. The synergy between cities and telecommunications infrastructures is evident. Telecommunications develop and are implemented inside urban areas, where the demand for telecommunications services is concentrated and where companies find majority of their clients. Telecommunications infrastructures are laid down along the existing physical networks: roads, conduits, energy pylons, using the same existing corridors of physical infrastructures that support other kinds of traffic.

The substitution option is probably the effect of telematics most often claimed to influence human actions. The idea that many tasks can be actually substituted by their virtual versions is at the basis of many predictions of revolutionary changes in urban settlements. For instance, it has been argued that introduction of telematics may produce a lessening of traffic congestion due to the possibility of substituting commuting with tele-commuting, or that virtual neighbourhood could take the place of physically defined communities. These claims are often based upon a simplistic vision of the relationships between the physical and virtual worlds, based upon a cause-and-effect type of reasoning. There is no evidence for this claimed substitution effect, especially when this is considered in general terms. Instead, the substitution hypothesis can be applied at the level of the individual
choice compared with the specific situation. As already argued, telematics provides alternative tools for carrying out certain behaviours that are complementary to the existing ones. The choice depends on the individual preferences and on his/her evaluation of the properties of the context. At the aggregate level, current knowledge does not allow any generalisation.

The application of telematics generates new behaviours. Better and more detailed information is available, and it is more easily accessible by telecommunications. The organisation of trips becomes easier and more efficient, and the motivation to join events and to visit places and people are stimulated. Mobile equipment makes it possible to perform tasks of work, social, or leisure nature in any place, thus allowing the combination of virtual spaces and physical places to produce new behaviours. Telecommunications also make possible contacts, transactions, and exchanges that were impossible before. For instance, virtual social communities can be formed independently from the physical location of the participants, products can be bought from any place in the world by electronic commerce and banks can also be accessed in different ways than before.

A fourth set of relationships refers to the enhancement effects of telematics. These refer to the use of electronic spaces and networks to enhance the capability, efficiency, and attractiveness of physical networks as roads, railways, airline networks, energy and water systems. Traffic control systems help to manage and control the traffic situation on roads to optimise their use and also to improve safety. Individuals and companies can make use of intelligent systems to support logistics, detecting busy roads and eventual impediments, and possible alternative routes. Information on parking availability is increasingly implemented in city centres to minimise unproductive driving behaviours.

Synergy, substitution, generation, and enhancement effects combine with each other in different ways to participate in the evolution of contemporary socio-spatial settings. These effects may be felt at different territorial scales. Assuming the residential area as the observation point, five of them are: region, urban area, neighbourhood, home, and furniture (urban and domestic), with a decreasing level of design abstraction. The function of the neighbourhood in relation to the Network City seems to play a key role for the design of future settings.

As we already mentioned in chapter 1, the network city can be considered as the convergence of three non-hierarchical levels of operators: the physical, the socio-functional, and the individual. In the previous chapters we have discussed some aspects related to the operators at the second and third levels: respectively, the social and functional domains of urban settlements, and the domain of the individual in his/her daily life. In this chapter we are trying to highlight aspects related to the first level, the physical domain of urban settlements. Up to now we have considered these aspects separately. Now we are going to discuss the aggregate consequences at the five scales mentioned earlier and listed in figure 8, chapter 1.

Here two possible developments can be predicted. On the one hand there are processes of reciprocal adaptation between physical, social, and functional components of the built environment: the degree at which the physical component is able to adapt itself at the changing situation is an important requisite for the re-organisation of functional and social environments. This process is shown in figure 8, Chapter 1, by means of dashed lines. On the other hand, adjusting the existing physical environment cannot accommodate social and functional developments any longer: the associated demands push towards the creation of new spaces and physical structures.

Both developments are possible and will probably take place at the same time. In both cases, however, design comes to the foreground as an operational tool to investigate the range of possibilities. Our opinion is that the former will be mainly adopted within the small-scale domain of individuals’ daily lives – where the person or the small group (like the household) is in charge. The latter necessitates that programmes and decisions be made on a larger scale, involving designers as well as managers and policy makers.

4.3.1 The scales of the region and the urban area
Networking is the concept that characterises the region and the urban area. At these scales, design should
address issues of movement and choice more than spatial components. This means to take into consideration both physical and virtual networks: electronic flows as well as roads, transportation, water, energy, etc. The vicinity between people and facilities is no longer the leading concept for the design of future cities. A better concept is the ability to reach amenities, their accessibility, which includes virtual vicinity.

Large-scale activities will be located at the regional and urban level, whose spatial position is determined by the need to be more or less physically accessible. Those activities able to attract masses – warehouses, shopping centres, stadiums, dance halls, sport complexes – will be placed where physical accessibility scores highly – e.g. along highways or around railway stations and airports. Those activities with a minor attraction power and a good potential for telecommunication – like major hospitals, poles for higher education, storehouses of tele-dealers, office buildings – will rely much more on virtual accessibility than nowadays if they support decentralised tele-services at lower scales. City centres will be the places where a variety of (public and private) organisations will have their representative seats and be the major dispensers of recreational, cultural and leisure activities, without forgetting their residential function.

According to Graham & Marvin (1996) the post-fordist global metropolis will evolve in line with the scheme in fig. 12 (adapted from Soja, 1989; Davis, 1992). Urban centrality will hold its importance especially for high-level managerial functions that cannot be transferred into flows. At the same time a number of sub-centres will spread throughout the urban area where physical and virtual activities will be concentrated. Edge cities at the margin of the metropolitan areas will be new centres for the suburbs. Residential growth will continue to enlarge urban areas with a suburban type of development. The dwellings of affluent groups will be located here, protected against the outside environment by gates, walls, and telematics surveillance. The connections of these affluent suburbs with centres will be of both physical and virtual nature. Graham & Marvin do not expect a large diffusion of the tele-work option.

Meijdam (1995) investigated the influences of telematics for the design of a new urban agglomeration. He distinguished three levels of design: the micro-level (ca. 600 m.); the meso-level (ca. 6 km.); the macro-level (ca. 30 km) – see fig. 13. The hypothesis is that the concentration of activities at the lower levels enabled by telematics can help in reducing forced car traffic towards higher levels. The macro-level will have an identity because of a concentration of high-quality services, its old city centres and other historical occupation patterns, and large natural areas. The latter will give a structure to the macro-level.

The foundation ‘Ontwerpen voor Nederland’ has investigated possible futures for the Netherlands by

1995 – the post-Fordist global metropolis

- Commercial centres
- Sub-centres
- Working-class residential areas

Figure 12
The post-fordist global metropolis.
Source: Graham & Marvin (1996)
means of researches and design workshops (OvN, 1998). One of the issues discussed in their activities was the influence of networks on contemporary societies. Some design proposals have been sketched to highlight possible design possibilities related to interpretations of the ‘network city’ concept. Here attention is paid to telematics applications as a support for networking lifestyles in different spatial situations. In these design projects the Network City is understood as a dynamic and safe residential environment, with only the most
necessary facilities in the vicinity of the dwelling areas. Communications and mobility between nodes are the main sources of inspiration for the design of the future urban agglomeration. Facilities and amenities are concentrated in strategic locations – nodes – easily accessible my means of physical transportation networks and telematics networks. Here the emphasis is on the 'reach' of facilities instead of their vicinity. The dwelling acquires added importance as the centre of spatial behaviour of individuals. Individual choices are more determinant for the design of urban structures. This requires more 'urban flexibility' in order to be ready to react to social changes. See figures 14 and 15 for the proposals.

Eisma (1998) has developed an interesting proposal that takes into account the contribution of telematics applications for the future urban agglomeration. In her proposal for a residential extension of Leeuwaarden, the capital of the Friesland province in the Netherlands, she confronted different possibilities of development and investigated those possibilities opened by the introduction of telematics applications (see fig. 16). In
particular, she focused on a development formed by ‘islands’ in rural environment, grouping dwellings around main facilities. The islands are connected by physical and virtual communications axis, and designed in relation to their landscaping properties. The islands are the nodes in the networking structure, they offer combined living-working possibilities and are equipped with the necessary facilities for daily needs. Thanks to the network character of the planned development, the facilities can be located in the one island and still remain accessible to the inhabitants of the other islands (see figures 17 and 18).

Another design project that takes into account the possibilities of telematics applications for the design of future agglomerations is the ‘Naples Cabled City’ project (Beguinot ed., 1989). In Chapter One (fig. 6) we have already mentioned this proposal as an example of the investigation over possible futures. This project makes particular reference to the substitution and enhancement effects of telematics that was discussed earlier. Telecommunications are seen as tools to cope with the complexity and density of the Neapolitan urban fabric, by substituting forced trips with virtual trips and

by enhancing the functional capacity of services. One statement made in this project is that the limited demand of space required by communications equipment will facilitate the re-use of existing buildings.

4.3.2 The scale of the neighbourhood
The scale of the neighbourhood in relation to the network city has a key function for the design of the future urban agglomeration. The role of the residential neighbourhood as centre of the spatial behaviour of people seems to be reinforced by introduction of telematics applications.
An empirical investigation on social and spatial aspects of home working has shown how the introduction of work in residential environments also raises questions and expectations regarding the immediate surroundings of the home (Ahrentzen, 1987). A conclusion was that "facilities and services instrumental to work tasks, such as the post office and copy center, take on added importance as neighbourhood amenities. Ambient neighbourhood qualities such as quietness, privacy, view, and places to walk, also gain importance. People now spend more time in their neighbourhoods. They need services which are amenable to their work, but they also want their neighbourhoods to be pleasant places to view, to walk in, and to impress clients" (Ahrentzen, 1987). See tables 1 and 2 for more details.

Tables 1 & 2: Amenities and qualities of neighbourhood areas according to homeworkers.

Source: adapted from Ahrentzen (1987)

<table>
<thead>
<tr>
<th>Table 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy Center</td>
<td>53.9%</td>
</tr>
<tr>
<td>Post Office</td>
<td>52.9%</td>
</tr>
<tr>
<td>Office Supply Store</td>
<td>40.2%</td>
</tr>
<tr>
<td>Peaceful and Quiet</td>
<td>30.4%</td>
</tr>
<tr>
<td>Pleasant View</td>
<td>26.6%</td>
</tr>
<tr>
<td>Privacy, Neighbours Leave You Alone</td>
<td>24.5%</td>
</tr>
<tr>
<td>Library</td>
<td>24.5%</td>
</tr>
<tr>
<td>Convenient to Downtown</td>
<td>24.0%</td>
</tr>
<tr>
<td>Quiet Walking Conditions</td>
<td>19.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>With Business Meetings at Home</td>
<td>Without Business Meetings at Home</td>
</tr>
<tr>
<td>Prestige</td>
<td>14.3%</td>
</tr>
<tr>
<td>Clean &amp; Unlittered</td>
<td>18.2%</td>
</tr>
</tbody>
</table>

In his investigation on the changing mobility patterns of tele-workers, Reisen (1997) remarks that the time spent at home and in home environment is significantly increasing in each of the four categories of tele-workers he considered. To him, 'this individual orientation to the neighbourhood can be enhanced by the provision of more facilities in the neighbourhood'. This study made it clear that tele-work alone cannot lead to any significant effect in reducing mobility, and hence traffic congestion, but it has to be considered as one instrument within a package of possible actions between which an effective urban planning is important. In particular, in

neighbourhoods Reisen (1997) sees chances for small shops that supply products for which people do not want to travel very long distances and that are not easy to choose via tele-shopping.

The new meaning that the local scale is acquiring for people is a relevant question and a departure point for the design of the neighbourhood. This requires an urban structure able to assure an easy accessibility of services from the dwelling as well as the presence of a number of ambient properties like the capacity to foster social life. The first aspect can be attained by combining telematics services with physical services, while the function of producing occasions of social interactions is mainly a matter of structure of urban fabric and of strategic position of services.

— It should be possible to access a whole range of services from the residential areas so that functional dependence from other locations is reduced – as far as this is the cause of forced behaviour. Easy accessibility of important services strategically located in the main nodes of the network city can be assured by good physical connections by means of roads and public transport. The alternative of using telecommunications to access these facilities for all these tasks which does not require physical contacts should be facilitated by introducing places for the performance of tele-activities in the many variants described earlier in this chapter. At the same time some services should be also present in the neighbourhood in their physical version, probably supported by telematics in their connections with higher territorial scales. They are important both for the desired behaviour of people and for the kind of goods dealt with. An example is given by shops selling fresh food and perishable products, hardly likely to be purchased via tele-shopping. Also, the physical connection with the higher territorial scales has to be designed in relation to the desired behaviour of people, by identifying poles of attraction at urban and regional levels.

— For what concerns the ambient properties of the urban fabric, a spatial structure is needed which can make easier outdoor social life, providing 'natural' meeting places to support a variety of activities of different natures for all ages. Besides, spatial qualities as privacy and quietness, and the availability of green areas, a clean and pleasant environment, and security
and safety will continue to score highly in the desires of people. For instance the combination of streets of ‘active life’, where a variety of functions and services can be located, with streets having a more ‘passive’ character, like privacy, quietness and residential use, may be introduced. This alternation of ‘passive’ and ‘active’ streets could be relevant in determining the layout of the neighbourhood (see fig. 19).

Socially relevant functions can be considered and introduced both inside and outside the centre.

There are not many design examples and realisations that take into account the contribution of telematics at the scale of the neighbourhood. However, two main interpretations can be pointed out. The first organises the residential settlement around a neighbourhood centre, or group of telematics facilities, that is the focal point of the area. In these examples the tele-centre also act as an attraction point for the social life of the neighbourhood. The dwellings can be equipped with an extra room, usually devoted to tele-work. In the second interpretation the tele-activities are introduced in the dwellings, with the clearly recognisable tele-work places facing a residential street. These streets are thought of as environment of action and social encounter. Facilities and amenities are located in relation to these streets. These two concepts are not exclusive of each other. Both can be realised in the same settlement.

The first concept has been applied in the design for a residential settlement in Miano (Gambardella ed., 1994). Miano is a downgraded suburb of Naples (I) that has poor physical connections with the centre of the city. A tele-centre has been introduced in the residential settlement with the goal of supplying the area with services, since the most services are concentrated in the city centre. The tele-centre is located in the central part of the plan, along with a square with commercial functions. The tele-centre and the square are separated by a green area for some leisure activities. The green area is equipped with a playground and benches. This combination of functions and services for the community makes the central area the attraction point for the neighbourhood (see fig. 20). Some dwellings

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**Figure 19**
Alternance between living streets and working streets.

**Figure 20**
Design of a residential settlement in Miano, Naples.
are equipped with extra-rooms that are particularly suited to house tele-work activities. Another example can be found in the above quoted work by Eisma (1998). One of the 'islands', labelled 'the fort', has been conceived as a residential environment broken into two parts by a central area of green and (virtual) infrastructures (see fig. 21). The idea of concentrating lively social activities in this part of the 'island' is evident.

The significance of telematics for dwellings and residential settlements has been one of the themes of the PAN 14 competition, the French precursor of the EUROPAH². Between the many proposals, the one elaborated by the group 'Télémaque' seems quite interesting (Eleb-Vidal et al., 1988). It is an example of the second concept outlined above. The dwellings are organised along a central street and a square and are equipped with tele-work places designed in a way to make them easily recognisable. They look like big cameras. The tele-work places face the central street at different heights contributing to a varied layout of the built environment (see figures 22 and 23). The central street leads to a cluster of tele-work places. In this proposal the tele-centre option is not considered. The tele-activities are performed in home-environment, and the place for social congregation is the street.

Figure 21
Settlement design of 'The Fort'.
Source: Eisma (1998)

Figure 22
Settlement design proposed by the group Télémaque at the PAN 14.
Source: Eleb-Vidal et al., 1988

Figure 23
The proposal of the group Télémaque: view.
Source: Eleb-Vidal et al., 1988

The neighbourhood centre
The tele-centre is often considered as a solution to introduce a mix of functions and services in residential environments, when the telematics option is considered. Most tele-centres are designed to house tele-work functions, and their structure and organisation vary according to the function of the centre. A general
disinction can be made between single-employer tele-centres and multiple-employer tele-centres (Bagley et al., 1994) being single-employer centres owned by a single company. Both types have pros and cons, to be considered in relation to the specific goals of companies and tele-workers.

Beside the work function, which remains by far the most relevant function in social and spatial terms, a tele-centre can also house a number of other functions as already noted in the first part of this chapter. Keeping in mind their main significance for the neighbourhood, the types of function housed, and the area of influence, we can distinguish three main types of neighbourhood tele-centres (Caso & Tacken, 1993): the specialised tele-centre, the multi-purpose tele-centre, and the supportive tele-centre.

— The specialised building or branch office or satellite office should be seen as part of a large company or government office enabling the decentralisation of a specific service. This kind of centre can, therefore, be used for single tele-activities such as tele-learning, tele-health care, tele-work and even tele-library. Its influence is related to a group of neighbourhoods (tele-health care, tele-learning, tele-work) or to the urban area (tele-library, tele-work). It should be interconnected with other kinds of centres with influence on the small scale of the city and with the headquarters of the specific function. In this way a school, a hospital, a library can be seen as a specialised tele-centre if it supports telematics connections with other centres.

— Different firms or government institutions offering different types of services share the multi-purpose building. One advantage is the possibility of sharing some common facilities. The level of specialisation of services in this kind of tele-centre is inferior to the specialised tele-centre to which the different parts of the multi-purpose building are (virtually) connected for a complete functionality. This type of centre should spread its influence over a single neighbourhood or a group of neighbourhoods.

— The supportive building is related to the small scale of the neighbourhood. It houses preferably non-business related activities supporting individuals in their daily life in the residential environment. All the tele-activities can be performed there, but on a smaller scale. This kind of centre should be interconnected with specialised types of neighbourhood tele-centres.

The spread of the three types of centres depends on the scale of their influence on the urban areas (fig. 24). A specialised building can exert influence on large parts of the city, even the whole urban area, while the multi-purpose and the supportive buildings are more related to the small scale of the neighbourhood (or group of neighbourhoods). The level of introduction of telecommunications devices in the home will influence the spread and the type of neighbourhood centres. The spread of specialised buildings also depends on trends towards the reorganisation of urban functions, especially of healthcare and education.

Figure 24 Hierarchy of neighbourhood telecentres.

In this work particular attention is paid to the supportive building. The spatial focus of the research is on the residential settlement. The hypothesis is that all tele-activities can be available in the residential areas, partly in the home and partly in neighbourhood centres. Some tele-activities are already being built into the house, for others people can choose to receive them at home or to go to the supportive tele-centre. In any case more specialised services will be available in neighbourhood
tele-centres holding a higher position in the hierarchy of centres in urban areas, with an influence on groups of neighbourhoods.

Compatibility items
A very important item for the design of a tele-centre is the compatibility between the different tele-activities to be performed in the centre. In particular, compatibility in time and compatibility in space are important: different activities can be performed in the same space, but at different times, or at the same time, but in different spaces. Keeping in mind the time and space aspects investigated in the previous chapter, we can study the compatibility items by summarising these time and space aspects in descriptive matrices. We carried out this operation in a previous publication (Caso & Tacken, 1993) for both the supportive tele-centre and the dwelling. The criteria chosen for the tele-centre, in the hypothesis that no work-related activities were included, were:

Space aspects
— The degree of diffusion of tele-activities. A distinction has been made between:
  - neighbourhood influence zone, for services that should be present in each residential settlement;
  - group of neighbourhood influence zones, for services that should remain close to residential settlements, but with no real need to be present in each one;
  - urban area(s) influence zone, for tele-activities that can be physically detached from residential settlements.
— Space consumption. Three different degrees have been classified:
  - high, for tele-activities needing a room or a large part of it,
  - medium, for tele-activities needing a part of a room,
  - little, for the tele-activities that only need of some equipment.

Time aspects
— The choice of the moment can be more or less discretionary according to the agreement between suppliers and users. The frequency of use can also vary. Here it is possible to distinguish:
  - daily frequency, for everyday activities,
  - weekly frequency, for activities once or twice a week,
  - monthly frequency, for activities performed a few time a month or yearly.

— The duration of the performing. Three different degrees can be distinguished:
  - long duration, when a large part of the time is devoted to the tele-activity,
  - medium duration, for complementary activities enabling some expenditure of time,
  - short duration, when a very quick connection takes place with a minimum time expenditure.

Specific demand
— Some tele-activities need more privacy than others, while for others again, the degree of isolation or concentration is essential.

The summary matrix for tele-activities in a neighbourhood tele-centre is reported in table 3, where the activities have been listed in relation to the inventory and the distinctions carried out in chapter 3 and the first part of this chapter. From this matrix the designer and the urban manager can get important information for

| 1. TELEWORK |
| 2. TELESHOPPING |
| 3. TELEBROWSING Information |
| 4. TELEBROWSING business |
| 5. HOUSEHOLD MONITORING |
| 6. TELE-HEALTH CARE preventive information |
| 7. TELE-HEALTH CARE preventive care & control |
| 8. TELE-HEALTH CARE care services |
| 9. TELELEARNING live communication |
| 10. TELELEARNING recorded communication |
| 11. TELELEARNING discussion |
| 12. TELELEARNING application |
| 13. TELELEARNING checking |
| 14. VIDEOHAPPENINGS |
| 15. TELELIBRARY in use |
| 16. TELELIBRARY educational |
| 17. TELELIBRARY issues |
| 18. TELECONFERENCING |

Table 3: Summary matrix showing characteristics of tele-activities in a neighbourhood telecentre.
the choice of the combination the most suits their tasks. Indeed the interpretation of the data reported in the matrices cannot be univocal. Many possibilities and alternatives can be thought of, with the specific situation to be faced as the main criteria for the choice. Our interpretation of the compatibility between tele-activities in the tele-centre is shown in tables 4 and 5.

Table 4 Space compatibility among tele-activities in neighbourhood telecentre.

On these basis we identified six main groups of tele-activities, also stating the required accessibility from the outdoor environment (Caso & Tacken, 1993):

1 short time and little space consumption – like telebanking, tele-shopping, tele-information easily accessible from outdoors;
2 medium time-space consumption – some leisure activities and some educational activities also requiring some privacy. They also need some degree of easy access, although less than group 1;
3 health-care centre, immediately accessible from outdoors;
4 larger time-space consumption, like education Also

work activities can be performed. Direct access from outside is not very important;
5 activities for a large public as tele-conferencing or receiving of special events. It can be also used as a small cinema or a theatre at neighbourhood scale, or for community meetings. Direct access from outside is required;
6 activities related to the technological functioning of the centre and the neighbourhood. Host computer. Only accessible to authorised persons.

These hypotheses have been further elaborated in the scheme of figure 25 (Caso & Tacken, 1993). It represents the spatial model for a neighbourhood tele-centre of supportive type. The triangles in grey represent the required accessibility from the outdoor environment and whether this accessibility should be mediated by an element of distribution. The net of lines in spaces 1, 2 and 4 indicates their flexible organisation in sub-spaces. Space 1 should be extremely accessible from the outside, and remain accessible also when the tele-centre is closed.
Examples
The tele-centre designed for Miano follows the above mentioned principles (Casó, 1994). The floor plans are shown in figure 26. Besides the six groups of tele-activities listed above, other functions have been introduced to support the functioning of the tele-centre and to make space available for cultural activities in the area, as a way to stimulate the civil growth of the neighbourhood. The hall and the help desk are on the ground floor, close to the main entrance. The café and the offices for the management of the centre are located on the first floor. The basement houses a small exhibition room, and some attention has been devoted to the spaces for community activities (number 5 in the plans). It has to be remarked that the concentration of services in the centre and the gain of space due to the use of telematics transportation, has made it possible to leave free the heart of the settlement in order to introduce a green area completing the role as a social catalyst for the central part of the settlement (fig. 20).

As already mentioned, most tele-centres are designed for work functions. Bagley (et al., 1994) have carried out an investigation on different types of tele-centres realised in the USA and abroad. Two of them are shown in figures 27 and 28. They are the Hawaii Telework Center and the KSP Creative Satellite Offices.

The first example is located at short distance from Honolulu, Hawaii. It is a private-public joint venture pilot project implemented with the aim of testing the feasibility and effectiveness of tele-work as a means of reducing commuting and air pollution. The tele-workers have different backgrounds: two thirds of them were workers from different municipal agencies, while the remaining third was employed in private companies. It is therefore a multiple-employer type of centre according to the definition given by Bagley (et al., 1994), or a multi-purpose type of tele-centre with a specialised function according to our definition. The work places are grouped in islands with light barriers avoiding others having...
visual access to computer screens. Some work places enjoy a better privacy. There is a common area for printers and other material tele-workers can share (Bagley et al., 1994).

The second example is located in the Kanagawa Science Park in Kawasaki, Japan. Also, this centre is the result of a public-private partnership. It is a work centre for multiple users, as it is accessible for both self-employed and for employees of companies. Use can be by individual or by group, on a drop-in or more permanent basis. Facilities include an auditorium for seventy seats, smaller conference rooms including tele-conferencing facilities, discussion rooms, ‘creative offices’, ordinary offices with workstations, cubicles and computing equipment. The centre is adjacent to a hotel and sometimes is used on a drop-in basis by its guests (Bagley et al., 1994).
Figure 28
Floor plan of the KSP Creative Satellite Office at Kunagawa Science Park, Kawasaki, Japan.
Source: Bagley et al., 1994

Figure 29
Design of Microsoft Headquarters in Amsterdam by S. Risseieuw: section.
Source: Sandra Risseieuw, Amsterdam.

Figure 30
Design of Microsoft Headquarters in Amsterdam by S. Risseieuw: floorplan.
Source: Sandra Risseieuw, Amsterdam.
In research on the effects of tele-work office buildings it emerges that designers should pay particular attention to the social qualities of future ‘tele-offices’. The author of the design project proposes a combination of stable work places and more flexible organisation to meet different situations and to facilitate social exchanges between workers (see figure 29 and 30).

To Blijleven & Kluiver (1995) the introduction of tele-work in office building and dwellings will largely influence the built landscape in the Netherlands. They predict the rise of small tele-work offices and neighbourhood tele-work offices where the combination of fixed work places and flexible ones is essential. Also these proposals seem to take into specific account the importance of spaces for gathering and social exchange in future ‘tele-offices’ (see fig. 31).

It is easy to anticipate that tele-activities that need more privacy will be carried out in dwellings, while for others a neighbourhood centre will be more suitable. The cost and quality of the equipment, the quality of the service, and the availability of supportive personnel will also play a determinant role in the choice of location. Moreover, the level of the telematics penetration in residential areas will be an important factor in choosing the best combination of ‘smart houses’ and type of neighbourhood centre (specialised, supportive or multi-purpose). One may expect that the position of neighbourhood tele-centres in the urban area and their size will vary with the number of tele-activities performed in the dwelling.

4.3.3 The scale of the dwelling
In the previous chapters we have seen how advances in telecommunications technologies support home-centred life styles. The role of the residential levels (neighbourhood and home) in the urban agglomeration acquires added importance for people’s lives. In particular, the dwelling seems to be very much the focus for the expectations raised by the possibilities offered by telematics (see e.g. Rijn & Williams, 1988). In the previous section we have described some design aspects at the level of the neighbourhood, taking into consideration different interpretations of neighbourhood structures and giving indications on the design of tele-centres. The focus of this section is on the dwelling, and the design aspects that arise when tele-activities are introduced in domestic environments.

The major challenge is made by the introduction of work activities. Research has shown that the incorporation of electronic work into the living space of tele-workers rises a range of social, psychological, and spatial issues which require careful consideration as they bear critically on the health and well-being of tele-workers and their families and, ultimately, on the viability of home tele-
working (Moran & Cullen, 1990). The complexity of the associated items is well expressed by the findings of a field investigation carried out in the USA (Ahrentzen, 1987). Among others, a conclusion was that “the meaning of home has changed for many of these homeworkers. For some, home has lost its refuge nature and acquired more of a confining or isolating one. They adjust to this by getting out of their homes regularly. For others, the workspace becomes a refuge within the home. The home might assume a professional identification, which is both liked and disliked. For others, the home identifies them with a strong and undesirable domestic image. In addition, people become much more aware of the space and order of their homes, and often respond to this by remodelling and more frequent housecleaning”. Other items were more of an organisational nature, as the position of the workplace in relation to the other parts of the dwelling: “in an ideal home, the bathroom and front entry would be close to the workspace. Rooms in which noise is frequently produced and bedrooms are preferred in distant locations from the workspace. Bedrooms are desired to be distant so that printer noise does not disturb sleeping household members. But also they reflect a ‘private’ area of the home which should be separate from the more ‘public’ workspace”. For more details see tables 6 and 7.

The findings of the case study conducted by Moran & Cullen (1990) with four people with physical disabilities who were working at home are similar to those mentioned by Ahrentzen. They identify a number of design items to be considered when tele-work is performed at home: relationships to the external environment; layout and adjacencies within the dwelling; workstation ergonomics; luminous and thermal environment; telecommunication; storage and security (see box 1).

Besides tele-work, telecommunications makes possible a large number of other tele-activities in the home, as it emerges from the inventory we carried out in the previous chapters. Relevant tele-activities that people may be wanting to perform from home are health-care, education, shopping, banking, leisure and recreational activities, information. The relevance of these activities in home depends upon the help they can give in making lighter specific problems of the household components.

<table>
<thead>
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<th>Table 6 &amp; 7 Desired characteristics of relationships between workspaces and domestic spaces. Source: adapted from Ahrentzen (1987)</th>
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| **Table 6**  
| Separate from “Living” or “Public” Area of Home | 22% |
| Amount of Space; Spaciousness | 17% |
| Natural Lighting | 16% |
| Separate, Private Room with Door to Close | 15% |
| Proximity to Kitchen | 13% |
| Spacious Home | 13% |
| Quiet in Home | 11% |
| View to Landscaping | 11% |
| Quiet Neighbourhood | 10% |
| **Table 7**  
| ROOMS WANTED CLOSE TO WORKSHOPS |
| Bathroom | 62.5% |
| Kitchen | 33.7% |
| Front Entry | 12.5% |
| Living Room | 8.7% |
| Den, Rec Room, TV Room | 6.7% |
| Bedroom(s) | 5.8% |
| **ROOMS WANTED DISTANT FROM WORKSPACE** |
| Bedrooms | 35.6% |
| Kitchen | 31.7% |
| Living Room | 20.2% |
| Den, Rec Room, TV Room | 17.3% |
| “Living” Areas of Home | 11.5% |
| TV | 8.7% |
| **ROOMS WANTED TO SEE INTO FROM WORKSPACE** |
| Outdoors, Yard, Balcony | 10.6% |
| Living Room | 5.8% |
| Corridor | 2.5% |
| Kitchen | 2.0% |

The elderly and the disabled may find important to tele-shop or to tele-bank from home; those persons affected by chronic diseases may consider introducing applications of tele-health care in their houses; the homebound or isolated person may also enjoy some tele-activities of recreational nature. Students may find convenient to engage in tele-education.

This range of possibilities can lead to the redefinition of the relationships between dwellings and the other scales of the urban system. Between the different possibilities, tele-work seems to be the most space consuming tele-activity. It needs a spare room with some degree of independence in relation to the rest of the dwelling (Ahrentzen 1987; Moran & Cullen, 1990). For the other activities is more a matter of re-organising the existing
space. However, it is important to assume an evolutionary perspective by designing a dwelling that can be easily adapted to the changing history of its inhabitants.

The most relevant aspects to take into consideration for the design of dwellings when telematics is introduced are: the relationships between individuality and collectivity in households; the ‘hyper-utilisation’ of home environment consequently to the growth of the number of activities made possible by telematics; the relationships between inside and outside.

— Many applications of telematics support individual behaviours in the household (Moran, 1992). Their introduction bears on the relationships between individuals in the household and on their social product as a group. One question in this area refers to the extent to which the facilitation of individual pursuits in collective spaces is a detriment to collective life. There is not much direct evidence to support this assumption, although some studies reported by Moran (1992) seem to confirm that the growing of individual activities in the household is not matched by a similar growth in shared activities. The new situations challenge established roles and rituals, which are re-adapted to produce new social outputs. In this process the organisation of the space in the dwelling is an important factor. Some technological appliances can facilitate the performance of individual activities in collective spaces, like for instance headphones and the ‘Walkman’. Others have the capacity of conferring some flexibility to the performance, like portable computers and telephones. But, in general, the organisation of spaces in the dwellings deserves careful consideration to avoid creating tensions about the use of the space.

— Instances of individuality and collectivity in household are closely tied in with the growth of activities to be performed in home environments as made possible by telematics. This phenomenon we called ‘hyper-utilisation’ of homes. The modern house has been designed for a limited number of activities carried out by individuals and groups with fixed roles in the household. It is evident that these structures may reach a critical point when they are confronted with a number of activities for different purposes, such as productive, domestic, supportive, and leisure. In our investigation we have already shown the time and space aspects of each possible tele-activity and their basic characteristics and relevance for people. These items ask for more space and more quality in the design of dwellings. It is important to face the related questions in order to avoid on the one hand that spatial limitations will impede people to enjoy the advantages of telematics, and on the other hand the rise of a demand of space that is difficult to match in already congested areas.

— A third point that is important to consider to design dwellings in which telematics applications are introduced refers to the changing relationships between private and public realms. Telecommunications alters the relationship between what is public and what is private in households. This especially applies to those interactive technologies that provides different forms of communications from and to the house. Video-phony, tele-conferencing systems, chat lines and instant messaging systems can be the vehicles of undesired intrusion in the privacy of domestic environments. At the same time tele-surveillance systems are all-seeing eyes able to detect movement to and from the house and can become a threat to privacy. Tele-shopping and tele-banking, and also the simple surfing on the Internet, leaves behind traces and information that companies can gather and use to detect your preferences and choices. All this alters the perception itself of public and private realms. The introduction of work activities in the house by tele-work also rises relevant questions about private and public realms. This especially applies when the work place is accessible to clients even if by telecommunications only.

As the dwelling becomes more and more a place in which domestic life is combined with the productive activities of the household, and in which a growing number of activities can be performed, the role and meaning of the home is challenged. The introduction of new activities in dwellings presents questions of quality and quantity. How should the layout of the dwelling be designed to allow the performing of new (tele-) activities beside the most traditional ones? How much space is needed to accommodate these new (tele-) activities in the house?

Compatibility items
At least two of the three points discussed above, individuality and collectivity, and ‘hyper-utilisation’ of
home lead to the question of the compatibility between different tele-activities in the dwelling, and between tele-activities and traditional activities. The investigation of compatibility between activities in home environment has been already carried out in a previous publication (Caso & Tacken, 1993). In the previous section we described the compatibility items for a tele-centre. Below we will give some information for the dwelling. For what concerns the introduction of telematics applications in the dwelling, the criteria chosen were:

Space aspects
— The degree of diffusion of tele-activities. A distinction has been made between:
- services available in all houses,
- services available in the house of specific categories of users,
- services available only to demanders.
— Space consumption. Three different degrees have been classified:
- high, for tele-activities needing a room or a large part of it,
- medium, for tele-activities needing a part of a room,
- little, for the tele-activities that only need of some equipment.

Time aspects
— The choice of the moment can be more or less discretionary according to the agreement between suppliers and users. The frequency of use can also vary. Here it is possible to distinguish:
- daily frequency, for everyday activities,
- weekly frequency, for activities once or twice a week,
- monthly frequency, for activities performed a few time a month or yearly.
— The duration of the performing. Three different degrees can be distinguished:
- long duration, when a large part of the time is devoted to the tele-activity,
- medium duration, for complementary activities enabling some expenditure of time,
- short duration, when a very quick connection takes place with a minimum time expenditure.

Specific demand
— Some tele-activities need more privacy than others, while for others again a degree of isolation for concentration is essential.

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Table 8 Summary matrix showing characteristics of tele-activities in the home.

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The summary matrix in table 8 shows the above mentioned items. Also, from this matrix designers and urban managers can acquire information on the significance of the introduction of telematics applications in residential environments. However, the matrix should be interpreted and related to the specific situation. Our general interpretation of the compatibility items in time and space is shown in tables 9 and 10.

This investigation permitted us to identify a number of groups of tele-activities that can be brought together in relation to the above mentioned compatibility criteria. The six groups we identified were subsequently confronted with the traditional spheres of the dwelling (table 11). In particular the six groups are:
1 the place of the productive activities like tele-work;
2 the place of domestic activities like tele-shopping, tele-banking, tele-information;
3 the place of the medical activities like tele-health care;
Table 9 Space compatibility among tele-activities in the home.

Table 10 Time compatibility among tele-activities in the home.

4 the place of the educational activities like tele-learning;
5 the place of tele-activities needing privacy and isolation like some applications of tele-banking;
6 the place for (collective) leisure and recreational tele-activities.

These hypotheses have been further elaborated in the scheme shown in figure 32. It represents a spatial model of dwelling when telematics activities are introduced. Some attention has been paid to the relation between inside and outside, which suggested locating the telework place in a transition position between the public and the private realms. The arrows in background colour indicate the need of more direct relationships between spheres and between the spaces and the outdoors public environment (Caso & Tacken, 1993).

Examples
Many ‘houses of the future’ and ‘smart homes’ have been designed and built in the last ten years. In some of them designers and developers tried to consider the
items associated with the introduction of telematics. Most of these examples, however, are developed with the commercial intention of promoting products of sponsors. In other words, “no model of home or its users has been developed which could underlie developments in the Electronic Home area. The initiatives are largely the result of a ‘technology push’ type approach” (Moran, 1992). In looking at the different proposals, it is important to highlight the philosophy supporting these proposals.

The floor plan of telematics dwelling in figure 33 was a first attempt of considering an integrated approach to the relationships between telematics applications and spaces of the dwelling (Casó, 1991). It originates from the idea that the greater number of activities made possible by telematics in home environment can be matched by a major spatial articulation. The creation of bay-areas, the introduction of more or less fixed separations, the provision of separate rooms, facilitates the performing of more activities in the same space. This approach is aware of the balance between individual and collective areas and the potential conflicts due to the need of using communal spaces for individual pursuits. Furthermore, demographic trends and changing lifestyles show a tendency towards fragmentation of the housing demand. This changing situation can be better matched by floor plans providing a more complete separation instead of open floor plans. Flexibility is intended to be a quality of the space, since this space allows the performance of different activities at the same time. In the proposed floor plan the flexibility is attained by adopting an articulated layout of the rooms, the subspaces of which are suitable for different uses, including the telematics ones. Points to be stressed are the position of the tele-work place, detached from the house, but still clearly belonging to it (number 4 in figure) and the position of place 1, in a mediating position relative to the collective spheres of the house. The structure of the work place is shown in figure 34. It derives, in part, from the guidelines developed in previous research (Moran & Cullen, 1990). Space 5 allows the receiving of ordered (by tele-shopping) items even when the house is not occupied. A space for the receiving of ordered items is also present in a design of dwellings elaborated by Bear Architecten (OvN, 1998). This space is coupled with a ‘telematicabox’ where the equipment for the performing

Figure 32
Model of spatial organisation for dwelling. The numbers refer to the distinction in groups of tele-activities mentioned in the text.

Figure 33
Floor plan of telematics dwelling.
Design: O. Caso, architect.

1 Tele-shopping, tele-banking, tele-information, tele-monitoring
2 Reception of video-happenings, tele-information, tele-learning (collective)
3 Tele-learning, tele-homework, tele-information, tele-health care
4 Tele-work, tele-information, databanks connections
5 Reception of ordered items.
HOME: PERFORMING PLACE 1

Figure 34 Structure of tele-work space. The close proximity of a toilette and a waiting space is an important aspect. Another aspect refers to the shape of the space that should be articulated in such a way as to facilitate different work-related activities.

of telematics activities can be plugged in (see figure 35).

Solutions for the design of dwellings when telematics is introduced have been proposed by some participants at the already quoted PAN 14 (Eleb-Vidal et al., 1988). The HARO group suggests concentrating telecommunications possibilities in a specific place within the dwelling, named 'l'antichambre du monde', having a function of transition between the home and the immaterial space of telecommunications. The Télémâque group introduces tele-work in dwellings at different scales. From the tele-work place owned by a single dwelling to places shared by more units, up to the cluster of tele-work places shared by 40 dwellings (see figure 36 and 37).

Figure 35 Dwelling proposed by BEAR Architecten.

Source: ORNI (1998)

Figure 36 & 37.
Telework places designed by the group Télémâque at the PAN 14 competition.

Source: Eleb-Vidal et al., 1988
Against this background we tried to design a group of dwellings in which telematics applications are introduced and that should allow a high degree of lifelong adaptability for many social categories, including different kinds of disabled people. Our aim was not to produce a ‘new’ design or dwelling concept, but to use existing design knowledge to accommodate a number of criteria. The design considers the home as a resource, either psychologically or socially or economically. For this reason, beside more traditional conception we (re-) introduced the concept of home as place of production of economic value. Some design principles and criteria are described below.

1 Flexibility in time to allow the dwellings to change according to the changing needs, life styles or history of the inhabitants. With minimal adjustments, the dwellings can be subdivided to meet the needs of e.g. a young couple, a family with children, a couple of elderly people, a three generation household, a student, etc. To realise this, the design is based on five spatial modules that can be assembled differently or easily transformed with the aim of allowing different dwellings configurations. The five modules (A, B, C, D, E) are reported in figure 38, together with the list of possible planned configurations. Every module is equipped with services and with its own entrance door. This makes possible configurations in which modules as A and C can be used either as a workplace or as an independent nucleus for those who wish to enjoy a certain degree of independence while still belonging to the household (‘together apart’) like an elder co-habitant or a son.

2 Design for all to make the dwelling usable and accessible in any part to every category of persons, including the disabled. The design has been made by keeping in mind the spatial requirements needed to allow the use of dwellings by different categories of persons, with special reference to wheel chair users and elderly people (Van der Voordt et al., 1996). Further adaptation of the dwelling hardware is hardly necessary: stairs are designed in line with the spatial requirements necessary for the installation of a platform lift at affordable cost. For this reason the stairs always climb straight with no change of direction. Another feature related to the stair is the moderate ratio between height and length of every single step designed according to Manser (et al., 1993).
4. Design Issues

Figure 39
Design of 'life-time' dwellings by O. Caso, architect. Structured in spatial nuclei, this design allows the formation of ten different combinations to meet the changing (spatial) needs of inhabitants with minor adjustments.

3 To accommodate the performance of telematics activities without necessarily affecting other domestic qualities. The separate rooms thought as a tele-work place have a position that avoids (undesired) interference with the rest of the dwelling. Distribution spaces have been articulated by means of bay areas and niches to allow the possibility to perform short or more occasional tele-activities (see also criteria 4, 5, 6).

4 To realise the maximum division possible between homework and living. The presence of a filter zone – formed by the patio and the distribution space – between the potential workplaces and the most living environment helps to meet this criterion.

5 No room for mono-functional design. Every space of the design has to be used for more that a single possibility. This applies also to the potential working units, which can serve as well as bedrooms or independent nuclei, and to the distribution space whose articulation in bay areas makes also possible to perform (tele-) activities.

6 Modules were made as independent as possible. This means that every module had the possibility of realising the needed services, including a kitchen corner and a full bathroom, and that easy access from the outside was provided in order to avoid undesired interaction with the rest of the household.

4.3.4 The scale of the furniture
The lowest scale of design we have considered refers to urban and domestic furniture. The relevance of this
scale can be seen in the process of adaptation of social and functional issues to the existing physical environment. These processes have been summarised in figure 8, chapter 1, by means of dashed lines. In other words, the existing physical environment has an own inertia that is important to consider especially at the lower scale of the urban system. It is not likely that people will start pulling down walls in their own houses to create more favourable conditions for the performing of tele-activities. More likely this goal will be reached by adapting the spaces by means of furniture.

Indeed, telematics has stimulated a wave of design in this field, especially for what concerns the home office. Products and furniture systems for a more comfortable working environment at home or in office buildings are increasingly present in producers’ catalogues. Multiple use of space, with the consequent need to conciliate different activities in the same place, may tend towards a further developing of this sector that is very important in the process of adaptation between components of the physical space we mentioned in a previous section. Figure 40 shows an example of a model available on the market.

In the field of urban furniture, design will focus on “telecommunication machines” dedicated to specific functions as tele-shopping, tele-banking, video-
telephones as evolution of actual telephone booths. Many examples can be already found in the form of Telematics City-information Points or Internet Access Points (see figure 41). Many functions have already introduced in their buildings such machines to provide information to their clients.

4.4 Summary and conclusions

In this Chapter we have explored the design aspects of city-telecommunications relationships. The first part considered the design aspects associated with single tele-activities, while the second part focused on the aggregated effects at different scales.

In order to make this operation we have considered the information gathered in the earlier chapters (Chapters 2 and 3) regarding the changing situation at the second and third level of the Network City model, and we have considered the possible consequences for the first level. We have been particularly concerned with the layout of performing places and with their position. At the aggregate level, we have interpreted the changing relationships between territorial scales, showing a number of design examples. The discussion of compatibility items amongst activities gave relevant indications for the design of tele-centres and of dwellings.

It seems clear that with the introduction of telematics applications designers and users are confronted with an increasing number of choices. Designers have a large number of options when they shape socio-spatial settings: these options concern the possibilities of introducing functions in residential environments, the direct and indirect consequences of these options, and the location of services and activities. Users have more freedom in choosing the modality to access services and other people, and they will take a decision in relation to the specific qualities of the socio-spatial context and to the situation of the moment.

This 'multiple choice' effect implies the need for more specific knowledge for designers, and the development of a repertory of solutions to be applied in different circumstances.
5. An Ageing Society
5.1 Focusing on the elderly

The ageing of the population is an evident phenomenon of contemporary post-industrial societies. In all advanced countries elderly people are a fast-growing social group. The effects of this demographic trend are already being felt, but they will assume greater importance in the near future due to the ageing of the baby-boom generation. Such a situation has never occurred previously, thus it is necessary to develop new methods and tools to cope with its potential implications.

Welfare policies are increasingly being put under pressure. Above all, the economic sustainability of actual policies is being questioned by the changing ratio between economically active and inactive population. The enormous amount of money needed for the care of older people also plays an important role here. The way in which available resources are distributed among the different social categories will be likely to cause tensions and conflicts between generations.

It becomes increasingly urgent to look for alternatives. The coming of the ageing society will demand new thoughts and solutions. It will be necessary to re-think the way in which our cities and societies are shaped as well as the way in which they function. It is, therefore, important for decision-makers, researchers, and designers to look at the implications for urban and architectural settings and the way to realise alternatives.

Looking for alternatives raises a number of ethical issues. Indeed, elderly people are a very vulnerable category, one of the weaker links in the social chain. Above all social and health issues often make it difficult for the older individual to interact with the components of the context. Especially those persons experiencing problems are threatened by the risk of adopting inadequate alternatives. The ethical dimension must, therefore, be carefully considered when we move towards possible alternative futures. This is especially significant as we are going to consider the potential of technology.

Firstly, the elderly have to be considered as a resource for the society rather than a drain upon it. This is a better response to the effective role played by older individuals in their respective social networks. Secondly, alternatives must take into account the opinions of the same elderly persons. Acceptance means that found alternatives are recognised and effective. Thirdly, the living context of the elderly has to be considered in addition. It is not possible to develop alternatives by merely introducing technologies to the elderly. The environment must be considered as well, and this refers to its different aspects: physical, social, and functional. Finally, and related to all the above-mentioned points, in no way should alternatives result in the downgrading of the situation and the quality of life of the people concerned.

Some alternatives can be realised with the assistance of the application of technologies, and of telematics in particular. Due to the time-space collapsing potential of telematics there is the possibility, at least theoretically, of overcoming spatial impediments and social distances for the benefit of persons with specific constraints, like elderly people.

This chapter aims to give insights into the average situation of elderly people by describing the most reported features of life in older age and by looking at the contribution of telematics to alternative policies. In a sense this chapter is an introduction to the case study conducted among elderly people that will be the subject of the next chapter.

5.1.1 An ageing population

In most contemporary post-industrial societies the population is rapidly ageing. As is well known, this phenomenon is originated by the combination of at least two factors: birth-rates decrease; and in life conditions improve.

Since the baby-boom period, which happened during the decades of the '50s and the '60s, demographic trends in industrialised countries have experienced a rapid decrease in birth rates. Complex sociological, economic, and psychological factors are the background of this situation, which resulted in the relatively low percentage of young individuals in comparison with older persons.

The second cause, and maybe the most determinant one, is the improving of living circumstances and improved medical knowledge which occurred in the later 50 years. The absolute number of elderly people grows
above all because nowadays they are able to live longer. Improvement in the health-care sector and a higher quality of dwellings, along with better nutrition has resulted in longer life expectancy.

Elderly people are usually defined in relation to a certain age limit above which a person enters the category. This age limit is somehow related to the legal age in which active work-life ends and retirement begins. This limit changes according to the legislation of the different countries, and this may cause some incongruence in the comparing statistical data. In Italy the ‘pension’ age begins at 60 years for women and 65 years for men, but these limits are changing since the actual pension system is the focus of a debate that will probably lead to a its global reform. However, there is some agreement in considering elderly people to be those persons in excess of 65 (abbreviated: 65+). Another distinction, which often occurs in literature, refers to the young elderly (65-80) and the very older (80+). Age being the sole determinant, this social group is characterised by a high degree of heterogeneity which makes generalisation difficult.

The combination of the two factors mentioned above is determining the growing of the social category of elderly people in both absolute and relative terms. A large part of future societal settings will be made up of older persons. Data mentions that in 2020 the number of people aged 60+ will reach a population share of nearly 25% in industrialised countries and of nearly 14% all over the world. Therefore the ageing of the population is a phenomenon which especially concerns western societies: in 1990, 42% of people aged 60+ and 59% of people aged 80+ were to be found in industrialised countries (Golini et al., 1993). In 2020 the Netherlands will have 20.5% of the female population aged 65+ and 17.2 of the males (CBS, 1999). The elderly population will increasingly be a female one, especially so far as the eldest are concerned.

The implications for the elderly of the future appear as reported in a booklet presenting the BESTA project (Clatworthy & Bjorneby, 1994): “If you are 50 today, in the year 2024 you will have a 1 in 6 chance of suffering from dementia. You will have on average 7.5 years left to live, have a 70 times greater risk of a serious accident than a 20 year older and have the company of ca. 25% of the population who are also over 65. However, you may find that 25% of the working population will be employed to look after yourself and your companions aged 65+ (if growth trends continue as they have during the last 5 years). The care system will cost an immense amount of money, much of which will go up in smoke, as home nurses spend on average two hours per day behind the steering wheel driving to and fro”.

Seniors are a fast growing social group in the Netherlands too, where in 1996 13.3% of the total Dutch population was older than 65. It is expected that by 2010 this category will reach a share of 14.9% (CBS, 1999). This pattern of gradual growth will demand ever more social and spatial policies specifically targeted to the needs of the ‘third age’.

Some implications are by now already manifest, while others can be easily expected in the future as the elderly population will peak between 2010 and 2040 due to the ageing of the baby-boom cohort.

5.1.2 Understanding ageing
The concept of health in the third age is an indicator of the way in which ageing is understood. This concept has evolved over time towards the more complex vision of nowadays.

Until recently older age has been regarded as an illness and consequently dealt with in a medical environment. Health impairments and diminishing psychical capabilities, a most common feature of life in older age, were considered mere medical problems having medical solutions. Accordingly, absence of diseases was the most important indicator of health of the elderly, determining their well-being. The debate on aged people mainly focused on cure functions. This vision has supported a somewhat negative concept of ageing as a process dominated by problems which makes people somehow incapable of pursuing active life styles. The corresponding social prejudice against the elderly was that of a weight to be carried by the family and the society.

This picture has slowly changed in later years. Older age is now seen as a stage of human life, in which medical instances are only one side of the matter. The absence of diseases is no longer considered as the most important
indicator of health of the elderly, in which psychological, social, cultural and contextual factors play a determinant role. Here, the capacity of the older individual to pursue the desired behaviour and to reach tasks and goals in daily living makes a determining contribution to the well-being of elderly persons. Cullen & Moran (1991) pointed out a number of implications of this vision for the actual understanding of ageing (see box 1). This positive conceptualisation supports a different vision of the role of the elderly persons, which are seen as contributing elements in social and family life rather than a problem-factor.

**Box 1**

Firstly, the emphasis on positive well-being suggests that we are just as concerned with adding 'life to years' as we are with adding 'years to life'. Secondly, the health of the elderly is intrinsically related to their ability to fulfill their aspirations and satisfy those needs which arise as a consequence. Thirdly, the environment, in its broadest sense, is seen as important in the promotion and maintenance of health. Fourthly, health is viewed as a resource for every day living, so that when we look at physical health, for example, the emphasis will be on the functional implications of physical conditions rather than their presence, per se. A final implication is that individuals themselves are often best able to identify those factors which affect their health and are active participants in defining their health status (Cullen & Moran, 1991).

This view can be considered as an ecological vision of ageing since it regards health as a resource for life, not as an aim in itself; and because it considers individuals embedded in their contexts of living: their ecosystems.

### 5.2 Implications of population ageing

Previous sections have made it clear that a social category with peculiar characteristics is emerging as one of the larger population groups of contemporary and future settings. This phenomenon has led observers and media to speak of an ageing society. But, what are the real problems associated with it? In the next sections we will deal with some major implications related to population ageing, and the way in which these implications may turn out to become important problems for future generations. This will serve to introduce the discussion on possible alternative policies and the potential contribution of telecommunication and information technologies.

#### 5.2.1 Political implications

The ageing of the population has political implications, since it coincides with the ageing of the electorate. Quite rightly Myers (1993) remarked that this phenomenon “has implications for the ways in which political campaigns are managed, the types of issues that are addressed, and at least the possibility that political parties may be restructured or come into being to further mobilise older persons in the political process. While these political developments are currently nascent for the most part, the increasing ageing of the electorate focuses attention on the important potential that exists for creating power bases that may be directed to the concerns older persons. This is especially true as pressures on the welfare state become emergent".

In Italy a political party representing retired persons has acquired some popularity in the recent past, pushing traditional parties and worker-unions to explicitly welcome the instances of pensioners in their political guidelines to gain their votes. Furthermore, about 50% of members of the three largest Italian trade unions is made up of pensioners. In the Netherlands a party representing older persons won parliamentary seats in recent elections.

The growing political importance of elderly people may affect the distribution of resources between generations, leading towards intergenerational inequity and consequently also towards intergenerational tensions. Although these consequences are actually only potential ones, Myers (1993) reports that in the U.S. the conditions of elderly people have significantly improved in recent years, while those of children have been stagnant or even deteriorated.

Again, Italy uses about 60% of its welfare expenditure for older persons, pensions and assistance; while only 3% is spent on the unemployed. This picture begins to create inter-generation tensions, as the plague of unemployment becomes greater: in the south of the country the unemployment-rate among young persons reaches 51%. The voting behaviour of the younger electorate (under 25) in 1996 revealed a growing predominance of the right wing, while the country is being governed for the first time in Italian history by a coalition headed by the left wing. This is significant because it represents a clear reversal of the traditional voting trend.
among young people in Italy, above all because it reveals a latent inter-generation conflict. Indeed, the political campaign focused on the reform of the welfare state, and the left-wing coalition won by defending the welfare system especially concerning the pension system.

However, this trend does not seem to occur everywhere in Western Europe. It is likely that elderly are becoming conscious of their potentially influential power and this has certainly contributed to bringing elderly people to the centre of the political agenda. The risk of inter-generation conflicts over resources distribution urges governments to set up adequate policies to contrast the actual inequalities without losses for the situation of elderly people.

5.2.2 Social and economic implications
As already mentioned, population ageing poses difficult questions for societies. One of these questions concerns their economic sustainability. Elderly people are mostly persons who are retired from the labour market, thus becoming part of the economically inactive population. At the same time, the social category of elderly people is a great consumer of health services: this is, on average, four times more than the non-elderly (OECD, 1987). On this basis population ageing challenges the capacity of the society to pay for pensions and health care services.

This has significant consequences for social policies. In combination with other contemporary phenomena, like growing unemployment, decreasing birth-rates and changes in the labour market, this tends toward a re-definition of the welfare state in most advanced countries. The ratio between the inactive and active populations is going to dramatically increase in the future, probably leading governments to stress cost-containment policies, and to set up political measures to encourage women, the unemployed, and the same elderly people to participate actively in the labour market. In turn, this may also restrict room for informal care.

Different policies aiming at reducing expenses are actually being implemented in most of the advanced countries. With reference to the health-care sector Myers (1993) mentions: cost containment initiatives; decentralisation policies concerning the management; de-

institutionalisation of certain population groups and development of community and in-home substitutes to care for such groups; the privatisation of (parts of) the health-care sector.

The implications for the health-care sector are far-reaching. If we consider the aggregate demand of the social category of elderly people, we see that older age is characterised by chronic diseases rather than acute ones, and by multiple pathology. This means longer and more frequent need for care, and specialised geriatric services. The disaggregate demand is characterised by the prevalence of health care issues for women, which induces major attention for typical women’s pathologies.

Other policies will be necessary with the aim of supporting as long as possible the active participation of elderly persons in the labour market and in social life. This is good for the economy and for the well-being of elderly people. An important pre-condition for this matter will be the possibility to pursue their outdoor desired behaviour. This will largely depend on how far they will be able to keep themselves mobile.

On the other hand elderly people often give back to society by partially re-distributing their incomes in their close family. They contribute to expenses, give money to their grandchildren, carry out tasks for relatives and friends for which otherwise they would have to pay. In Italy many grandparents take care of their grandchildren, so that both parents can work and expenses for kindergartens can be reduced. More dramatic is the situation, happening especially in the south of Italy, in which the state pension of one elderly member is the only income in families in which all members of working-age are unemployed.

Another micro-economic feature refers to the emergence of elderly people as target group for industrial products. Their number and their growing purchasing power opens up a potentially wide market for industries. It can be expected that this market will deal more and more with services and artefacts especially directed towards the needs of the third age. Thus, indirectly, the ageing of the population will also produce expansion for firms and factories and, consequently, will create job opportunities.
However, it must be remembered that, notwithstanding average upgrading, many elderly persons are situated within the lower-income categories. Recent data from the Netherlands (SCP, 1996) shows that about one third of elderly people are economically well-off (above average), 50% have an income between the minimum and the average, and 15% of seniors earn a minimum income.

5.2.3 Spatial implications
Spatial policies as well as the design of the built environment will be affected by these trends. On one hand, an ageing society will require different spatial quality, for instance, in relation to problems of security and safety, and the accessibility of urban services. On the other hand a demand will grow concerning the need of an improved awareness of the problems of elderly people when designing the built environment.

It has been already remarked that the actual urban environment has been targeted towards the young, white, healthy male, being, therefore, one major impeding factor for the less favoured categories of people. This one may sound like a slogan, but it is a fact that the spatial needs of the most disadvantaged social categories have been significantly disregarded. For instance, regulations against architectural hindrances e.g. accessibility, are relatively recent in many countries, and they often refer to only a part of the built environment. Generally speaking, there is still little awareness of the spatial and architectural needs of least favoured persons, and this is essentially a cultural challenge. Elderly people are one of these less favoured groups.

However, recent years have seen the realisation of a certain number of experiments concerning housing for elderly people, generally based on the building of dwellings in which architectural obstacles are practically absent, and which are combined with a certain number of common (care) services. These experiences are often realised in the light of ethical instances which represent quite a turning point of a cultural nature. The focus is no longer on building for a specific social group, but for every category: design for all.

The improvement of security and safety in residential and urban settings will be one of the main issues in the future. With older individuals increasingly being assaulted or robbed, or victims of accidents, especially in their home environments, these issues will become a necessary and demanded requisite for future designs and designers. It can be expected that this will also be demanded by other social groups, since security and safety, both outdoor and indoor, is an value appreciated by everybody.

Services will need to be made accessible to a growing and ageing public and this will influence the kind of service to be delivered as well as its location and structure. Infrastructure such as hospitals and health care centres will also need to adjust their functioning by offering more and more geriatric services. In many cases they will need to add specialised geriatric sections to their organisation.

The design of the public transport will be also influenced. This refers to the kind of transportation mode routes and frequencies, the lay-out of the waiting places and information boards. Spatial policies on this point will be especially important to avoid the risk that the supporting of elderly mobility may result in increasing traffic congestion and in a danger for other drivers 4.

5.3 Alternative policies
In the light of the described implications and problems, governments are trying out possible alternative policies. These policies mainly concern the problem of the growing economic pressure exercised by the social category of elderly people upon health care and welfare budgets.

All advanced countries are promoting experiments and taking action to reduce costs. Much attention is paid to health care issues, since elderly people are the major consumers of health care services. As already reported in a previous section, possible actions in the health care sector mainly include cost containment; decentralisation of management; de-institutionalisation of certain population groups and privatisation of (part of) the health care system (Myers, 1993).

Measures to contain costs refer to a number of actions that are taken to reduce the demand for health care
services and to diminish their costs. Examples are the introduction of co-payments, the reduction of the length of hospital stays, the centralisation of specific services needing expensive technologies, and so on.

Management can be de-centralised to transfer responsibility for policy decisions and costs to local authorities. This can make savings making it possible at the same time to better meet the needs of the population of a specific area. Of course, the better, well-off regions are more able to welcome this policy and to get the chance than poorer areas are.

Another policy which is increasingly being adopted aims to de-institutionalise certain population groups such as people affected by chronic diseases or by mental problems, the disabled, elderly people and long term terminal patients. A central point is to supply and promote substitutes for institutional care in the residential situation for those concerned. The success of this policy depends on how far it is possible to substitute institutional care with home-care effectively, and how far these home-care systems are less costly.

Finally, privatisation of (part of) the health care sector is also a possible policy. In this hypothesis prices should be kept affordable by competition in the health care market. This policy can allow higher savings, but it is also the most risky one. Here governments should introduce 'social parachutes', for instance, in the form of affordable insurance for the less well-off, or market regulations e.g. by fixing maximum tariffs for essential services. Privatisation is also the most difficult policy to implement, since it strongly affects the traditional role of the state in the health care sector.

From the above mentioned policies, the most relevant to our goals is the one concerned with the de-institutionalisation of certain social groups. Indeed, this is the most significant for urban and architectural settings since it directly involves the residential dimension of elderly people, and offers possibilities of the application of telecommunications technologies. While some cost containment measures may be relevant for cities, with special reference to the concentration of those services requiring expensive technologies in few 'super-hospitals' or major health-care poles which consequently creates a distance-gap for large parts of the population with the related problem of the bridging of this distance.

To support elderly and disabled people in their own homes and residential settings rather than in institutions or nursing homes is a part of the de-institutionalisation policy which many countries are trying to put into practice. Home care means bringing care services, and even some cure services, if necessary, within the residential environment of the people concerned, the home and/or neighbourhood. This should permit the elderly to get the same quality of care as in institutional places, but remaining in their own residential environment until they (eventually) reach a late stage of illness.

The Dutch government is trying to implement this policy to reduce the costs of intramural and institutional care and to improve the living circumstances of elderly people and their (informal) caregivers. In the Netherlands a relatively large percentage of older people are living in older people's homes or nursing homes: about 20% of the population over 75 (Coolen, 1991). Home care is seen as an attractive alternative for both parties: budget savings and people's desires. Indeed, elderly people often show themselves dissatisfied with the traditional institutional services, that are found to be much too care oriented and which leave no room for domesticity or other, more personal, dimensions. Interesting alternatives which arose in recent years are the so called 'housing care projects' (Houben & Van der Voordt, 1993), a combination of residential and care facilities whose housing characteristics are underlined and where care functions are more individualised.

5.4 Key points

In the Netherlands, home care has been defined as "the entire system of care, nursing, treatment, and counselling of clients living at home, that performs its task using self care, care by persons in the direct social environment, volunteer aid, and/or additional professional care" (Quoted in Gott, 1995)).

The Dutch social policy concerning de-institutionalisation is based upon two most important points: — to give the elderly the possibility to continue to dwell the same house in the same neighbourhood for as long as possible;
— to increase the social participation of the elderly.
These two points are strongly dependent on a number of
closely inter-related factors influencing the scale at
which de-institutionalisation policies can operate. To
increase the possibility of applying these policies to a
larger population of elderly it is necessary to take these
factors into consideration and to develop concepts and
tools to make them more effective.

Firstly, the level of independence of the elderly person is
very important. Continuing to dwell the same house and
in the same neighbourhood implies the ability to cope
with the functional and physical tasks of daily living.
Secondly, to participate in social life means to be able to
pursue an outdoor behaviour. An important pre-
requisite concerning this is the capacity of mobility.
Thirdly, it pre-supposes the existence of supporting
networks of social nature around the elderly. The
community should be able to give enough informal care
to the elderly persons who need it, helping them to
achieve the goals and tasks of daily living, including
social relationships.

5.4.1 Independence
Literature regards 'independence' as the most
important criterion for quality of life in the third age. Fisk
(1986) maintains that "independence is a state of self-
determination whereby the individual, with or without
the assistance of others and regardless of disability, is
able to dictate the path that his or her life should take. It
is a state that is determined both by personality and the
individuals social and physical environment".

A crucial point is indeed the relation between elderly and
(informal) caregiver, and how far this relation may
proceed with the elderly still being considered
independent. In fact absolute independence seldom
occurs in the world of the elderly, whose psychological
and physical characteristics often require some kind of
inter-dependency. It is, maybe, better to speak of relative
independence for those elderly persons who,
notwithstanding the presence of physical and/or mental
impairments, retain the ability to operate the choices
which regulate their lives. After all, everybody enjoys
some level of inter-dependence, at least as a feeling of
being embedded in a certain social structure or social
network.

This concept is clearly expressed by Fernie (1991) who
reports a similar concept as Fisk does, if we assume that
self-determination of the previous definition stands for
choice in the following statement: "many developers of
technology and providers of service emphasise the
independence of the elderly as the primary goal.
However, many of us enjoy interdependent life-styles in
which we are dependent on other members of the family
or community for some functions and they are
dependent on us for others. Such dependency
relationships can often be viewed as positive. In many
cultures, dependence in older age is viewed as an
entitlement and the elders are accorded great respect.
Perhaps choice is a better objective".

Therefore, especially in older age, independence may
require the help of others — e.g. formal or informal
caregivers — under condition that the choice of asking
for help remains with elderly. A very important factor to
be considered is that independence is a personal
dimension characterised by a subjective evaluation that
an individual makes of his/her situation in relation to its
context. An absolute value of individual independence
cannot be stated. Independence is a relative matter
depending on how far an individual in able to cope with
the context.

In the actual situation the level of independence enjoyed
by the elderly is often not sufficient, and many older
persons have to be supported in institutional facilities.
The main problems relate to the health situation of the
elderly compared with the scarce capacity of support
from the environment. Therefore, tools and concepts
have to be developed to improve the independence of
the elderly by improving both the quality of the
environment and the capacities of the individual.

5.4.2 Social participation / outdoor behaviour
The ability to participate in social life is also an indicator
of independence. This involves the capacity of the
individual to cope with the context, where the emphasis
is on the outdoor behaviour of the elderly. Indeed, social
participation often requires going to places in which
social contacts may happen. This applies not only to
events of specific social relevance, such as a party, a club
reunion, or a theatre representation, but also to most
common activities involving relationships with others,
such as shopping, banking or visiting friends and
relatives. Even walking through the neighbourhood has a social component, since one may meet other faces that are more or less known. These social activities usually imply the travelling of a distance. In this sense an important pre-requisite is the retention of an adequate capacity of mobility.

Research has shown that active outdoor behaviour decreases with age, and that the possession of private transportation (mostly a car) is an important influencing factor (Tacken, 1993). A very relevant role is played by growing degree of health impairment with increasing age, but also contextual and organisational factors contribute to the explanation of this phenomenon. Active participation of elderly in social life is not only made more difficult through the possible loss of function of the senses, or through chronic illness, or the lack of social and material resources, but also increasingly through unfavourable environmental and technological conditions (Mollenkopf et al., 1997).

Lack of mobility has significance for the well being of the older individual, who may increasingly become home-bound, consequently loosing great part of social contact and the related perception of societal standards.

Keeping the elderly mobile is therefore an important challenge. Tools and concepts should aim to support the mobility of the elderly by increasing accessibility into the environment. This can be done in different ways: by operating on the context to eliminate impeding factors and hindrances; by increasing the elderly individual's ability to move by supporting the personal capabilities and by diminishing the importance of distance for social happenings.

### 5.4.3 Community care

In discussing the concept of independence we remarked that this is a relative concept. Indeed, some kinds of inter-dependent relationships can be viewed as positive, and this especially occurs in older age as people may need the help of others (caregivers) to pursue an independent life style.

The caregiving may be formal or informal in nature. In many countries there are organisations, both public and private, which are specialised in giving care to people in their own residential environment. Remarkable in this concern are the associations of volunteers who spend their time caring for the others without any payment.

Many problems are solved within the social networks surrounding the elderly, thanks to the informal activity of relatives, friends, and neighbours. The role of these networks is often neglected in research in this field, notwithstanding their enormous importance for the well being of the elderly. In these networks inter-dependence is often a common phenomenon in which elderly people are not always on the receiving side. As already remarked they often actively contribute to their networks, in turn receiving the care they need when problems arise or when they are impeded from pursuing a specific behaviour.

These situations can be related to the physical or mental side of many activities, like shopping, driving a car, self dressing or washing, or managing complex equipment or organisation; but, also to the psychological sides of many situations, like the need of (emotional) support after major life events such as retirement or bereavement.

The actual socio-economic conjunction is rapidly eroding the community potential for informal care. This was an activity traditionally performed by women, whose increasing participation in the labour market is restricting time for informal care. It is important to find new solutions to improve the capacity of the community to care for the seniors. New policies have to be introduced which stimulate informal care, maybe in the form of allowances or economic advantages for caregivers. At the same time, the potential for care can be supported by introducing new tools to overcome time-space constraints of caregivers.

### 5.5 Aspects of life in older age

The elderly are defined as those persons older than 65, but the banality of this definition hides the complexity of the theme. Since age is the only distinction, this social group is made up of very different cases and situations. This heterogeneity makes it impossible to describe the whole group by generalising from a few cases. For instance, research has shown the existence of a variety of 'social types' among elderly people. Cullen & Moran (1991) reported the principal life-styles identified
by Taylor & Ford (1981): taking life easy; gregarious; solitary; spouse centred; invalid; altruist; hobbyist; family centred; work centred; and full life.

The most interesting, to us, cases are the ones which present some problems in relating with the (outdoor) environment, problems caused by the ageing process itself which does not allow the possible carrying out of a desired behaviour any longer, and which technology may make easier. This is because the territorial focus of our investigation lays in the scale of the residential area and is concerned with the potential of telematics to help older persons to cope with problems at this territorial scale.

Notwithstanding the lack of homogeneity, a number of average characteristics can be recognised which are shared by elderly people. These features, drawn from the literature of investigation, may be present in some individuals more than in others: nevertheless they constitute a general picture of the characteristics of life in older age.

International literature usually focuses on a number of issues which are considered of particular relevance for aged people: the health situation, including memory problems and the capacity to manage complexity; leisure activities; social contacts; security and safety; activities of daily living (ADL), including mobility items; caregiving and social networks. In different ways, these issues impinge critically on the three key points previously outlined: independence; outdoor social behaviour; community care potential.

Health issues dominate amongst all these items, since they influence many other sides of life in older age. However, as already mentioned, health in older age is influenced by many other factors, social and psychological, which affect the self-esteem of individuals. Concerning this, it is also very important to remember once more that ageing is as a period of the life which is characterised by changes, such as retirement from work, modification of social networks and bereavement. This is particularly relevant for the psychological well-being of the elderly, in which social aspects have a very delicate and important role. Cullen & Moran (1991) underlined this concept by writing that “concern about the social aspect of elderly people’s lives has been prompted by a number of factors. First, there are the role changes associated with retirement and changes in the family life cycle which are typically experienced by the elderly. Second there is the increased likelihood of losses in interpersonal relationships due to bereavement. Third, there are the possible restrictions in social participation because of functional limitations on the part of the elderly person, because of environmental barriers, or because of a lack of suitable opportunities. Finally, and related to all these, are concerns about the more general image of the elderly in society, especially regarding negative stereotypes and ageism in contemporary western culture”.

5.5.1 Health impairments
Declining mental and physical capabilities are a constant background in older age. This should be seen as a changing situation depending upon the ageing process itself, in which bodily functions and mental capabilities slow down. This process is not necessarily disabling. Compared with younger persons, elderly people are more likely to be affected by chronic diseases than acute diseases, and by multiple pathology. This also means diminution of recovery capabilities and longer and more frequent need of care. Due to this process, some elderly persons experience a rise in the number of problems that affect their relationships with the (social and spatial) context.

Cullen and Moran (1991) reported a list of most diffuse health diseases in older age by analysing international literature. Arthritis, cardiovascular diseases, hypertension, diabetes, as well as a diminution in hearing and visual capabilities are common health problems in older age. The elderly experience a general and progressive diminution of their strength, having effects on their relationships with things, people, and situations. Many elderly persons learn to co-habit with their chronic diseases, especially if they are not disabling for their daily living.

A mental impairment often occurring in older age is senile dementia (Alzheimer’s disease). This is a major problem since demented elderly are likely to represent those making the greatest demands on care systems in the next fifty years (Bjorneby, 1994). Furthermore, this is the group for which it is more difficult to provide independent living environments.
The distinctive features of dementia are loss of memory, language, and perception, both in space and social standards. This results in a number of practical problems like disorientation in time and space, indoor and outdoor accidents, problems with dressing and nutrition, purposeless and agitated behaviour. Demented people may make no distinction between night and day, good or poor weather. They may lose the way and forget their names or addresses. They could have left a fire on in the kitchen or forgotten to take common precautions working with electricity. They may refuse to eat or be incapable of preparing food, or even wanting to walk outdoors without proper clothes (if any!).

In many cases dementia left no other solution than to rely on formal care or other types of continuous care. The challenge is to be able to postpone this moment till the latest stage. This means prolonging the time before the elderly become socially and functionally disabled because people become gradually affected by dementia. This is also a very difficult moment for the person who may be aware of being in early stage of dementia and consequently getting aggressive and suspicious, or feeling depressed and refusing social contacts.

Alzheimer’s disease is the most relevant mental problem in older age. But, also persons who are not affected by dementia may experience mental problems such as a diminution of their ability in managing complexity. Whatever the causes may be, depending upon psychological factors or upon problems of an organic nature, this influences their capability of using technologies or of adjusting their life organisation to the changing situation in urban settings (re-organisation of services, new rules, new timetables, and so on).

Health problems are the most important feature in older age, since they affect the relationships between person and context. With increasing health impairments it becomes more difficult for the senior to cope with people, tools, and situations, negatively affecting the well-being of the older individual. Since health in older age does not simply depend on medical matters, but involves psychological, social, cultural and contextual issues, the elderly may enter a vicious circle that worsens the health situation of the individual. As Teague (1991) wrote: “functional decrements associated with the ageing process often lead older adults to pursue sedentary activities or activities that require minimal mobilisation. The danger of immobilisation is self-cyclical; i.e. sedentary activity leads to poor health which leads to more immobilisation which leads to even more deleterious health”. The effects of inactivity on the elderly person can be very relevant, leading to a series of negative symptoms known as ‘disuse syndrome’.

It is, therefore, important to stimulate the elderly to pursue an active life-style perhaps the practice of hobbies or other light occupations, the sharing of interests with other persons, carrying out small pieces of work of common interest, and stimulating self care. Absence of interests or of a stimulating life-style is especially negative in early stages of dementia since the need to be active may otherwise result in wandering.

5.5.2 Safety and security
Another much reported feature of life in the third age concerns safety and security. Many elderly persons feel themselves unsafe in contemporary settings. This is both a psychological feeling, also deriving from the consciousness of getting weaker, and a somehow objective phenomenon, many older persons are the victims of assaults and/or accidents. At the same time safety and security also relates to urgencies and to (domestic) accidents, one of the most prominent causes of danger in older age.

Psychological security depends on many factors. It refers to how safe people feel themselves in a certain context. It is a subjective evaluation that elderly people operate of the characteristics of the context in relation to their capabilities.

Firstly, we can mention that the elderly are usually conscious of becoming weaker and less sharp with increasing age, thus being an easy target for some micro-criminality. The perception of the surrounding environment is also influenced by news (official, but especially unofficial sources) reporting the frequency of acts of crime. This perception relates not only to the outdoor environment, but also to their own indoor environment. The fear of unwanted intrusion or experience of a break-in may greatly affect the feeling of security.

Secondly, characteristics of the context as spatial design,
the volume of motorised traffic (car and motorbike), perceived scarce support from the social context, absence of warning systems in the case of need, are also elements of the evaluation defining the psychological perception of the degree of safety and security of the context.

Thirdly, the emotional and psychological situation of the individual must be taken into account. They could feel themselves isolated and/or alone, sometimes even abandoned, detached from social networks or falling out with relatives and friends. Satisfaction with their own life plays an important role in this concern, as well as previous negative experiences with accidents or other problems also do. This may result in the perception of not having the necessary support to allow coping with their environment.

Security and safety are also a more objective need for elderly people, where we want to stress objectively the difference from the subjective dimension of psychological security described above. This can be related to different situations, such as domestic and outdoor accidents, emergencies concerning health, assaults to the persons.

The risk of accident grows according to age and to the degree of frailty of the individual. Demented people, especially, can become victims of accidents, since they may have lost any perception of danger. Domestic accidents are the most common events which include falling, accidents related to cooking and electric shock. Most of these accidents are the result of inadequate dwelling design and insufficient protection systems. The design of the outdoor environment is also the cause of many outdoor accidents. Architectural obstacles, heavy traffic, the position of zebra crossings and the duration of traffic lights, the poor design of public transport and waiting places, the absence of pedestrian spaces, poorly or unevenly paved pathways may cause a number of accidents to the elderly such as falling or being run over a car.

The design of the environment is also important in relation to the risk of being assaulted or robbed. Isolated and out of sight places may become dangerous for persons passing by and especially for the elderly. This risk also relates to the indoor environment: apart from burglary, the elderly may be induced to open the door to unknown persons both because they are tricked by them and because they may appreciate some social contacts. However, this is often a very traumatic experience for the elderly.

A very relevant field of study concerns the case of personal emergencies. This applies when domestic accidents happen or in relation to suddenly occurring health problems (e.g. heart attack). In this case the rapidity of the provision of help is extremely important, and this often depends upon the capacity of the elderly to call for help. These problems are especially significant for the elderly person who lives alone.

Issues of security and safety often inhibit the elderly person from pursuing a certain desired behaviour and affect their independence. Independent living and social participation are highly related to self-confidence. When this diminishes, the result may be a desire for or a need of being institutionalised.

5.5.3 Activities of daily living (ADLs)
Health impairments and psychological problems affect the ability of the older individual to cope with people, things, and situations: in one word, with the context. The impediments caused by these age-related problems depend on their effects on the functional ability of the person, more than on the problems themselves. Quite rightly Cullen & Moran (1991) remarked that “traditional disease-oriented and acute care approaches in medicine are not always most appropriate for the elderly and that levels of functional ability must be of central concern. In particular, it is functional status rather than diagnosis which will determine whether the older person can live an independent life in the community”.

It is mainly the ability of the individual to perform activities in a certain socio-spatial context which determines the degree of independence of individuals, their capacity of carrying out a social life, the kind of care required from the community. The functional ability of a person is defined in relation to activities that individuals perform in their daily livings (ADLs), which are very large in number. Indeed elderly people form in this respect a very heterogeneous category, since the kind of age-related impairment causing the diminution of functional ability, and the type of functional ability, can be of a very different nature.
Therefore, ADLs have been usually distinguished in
different groups on the basis of different criteria. In this
concern, our cultural and philosophical conception of
ageing is an influence, since it suggests which activities
are important for daily living and which others are not. A
very common distinction refers to primary activities,
mostly performed for personal care, and secondary
activities, instrumental for the supporting of other
(primary) activities. The criteria often adopted to
distinguish primary activities from secondary ones
concern their relevance for independent living.

Fernie (1991) considers as ADLs a number of activities
related to the (care of the) person and that are mainly
performed indoor: eating, toileting, bathing and
grooming, dressing, housekeeping and maintenance.
The importance of other age-related issues like
recreation, socialisation, personal and environmental
mobility, and others again is also recognised, but they
are not included within the ADLs group.

Dealing with ADLs, Cullen and Moran (1991) distinguish
two parts: the physical / personal related activities and
the instrumental activities. In this twofold distinction,
ADLs are further subdivided into four groups having as
main criteria their function for the elderly. Nutrition,
Hygiene, Mobility, Environment are these four groups.
Indoor and outdoor activities are not distinguished,
even if physical / personal activities are mostly
performed indoors while many instrumental activities
relate to the outdoor environment (see box 2).

A similar distinction is made by Teague (1991) who
wrote of the activities of daily living skills (ADLS) and
instrumental daily living skills (IDLS). ADLS are mostly
related to the care of the person and include activities as
eating, toileting, dressing and continence; while IDLS
involve activities as travelling, shopping, walking, and
housework.

The distinction that we are going to make will refer to
the above mentioned distinctions and to our research
need of separating indoor (home) environment from
outdoor (neighbourhood and city) environment. This is
because of the main feature of telematics already
explained in the previous chapters, telematics is another
communication medium between different spatial
scales, and because of our interest in the spatial scale of

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<td>Fueling Solid-Fuel appliances</td>
<td>Weekly Refuse</td>
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<td>Daily Refuse Disposal</td>
<td>Disposal</td>
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box 2
Source: adapted from Cullen and Moran (1999)

the residential area. Our criteria will relate to the three
key points discussed in a previous section of this
chapter: independent living; social participation;
community care potential.

Accordingly we will distinguish between activities of the
personal/physical daily living (APDLs) and activities of
the instrumental daily living (AILDs); and between
activities performed in indoor and outdoor contexts.

**Indoor ADLs**

Indoor APDLs are very basic activities that bear
fundamentally upon the ability of older individuals to
live independently in their own homes. Eating, washing,
dressing, toileting, rising from bed or from chairs,
moving through the dwelling, manoeuvring doors or
switches are activities which belong to this group.
Although several alternatives or specific assistance can
be found, problems with these skills are most severe
impediments for independent living since they require an
almost continuous assistance from caregivers. Therefore,
they demand a great effort from the community care
capacity. Assistance regarding these activities is often
unattractive for caregivers, especially the informal ones.
At the same time, disabled elderly people tend to refuse help, especially if it comes from persons they do not know, due to private nature of the activity.

Indoor ADLs refer to activities as cooking, laundry, ironing, cleaning, maintenance and repairs, housekeeping management, housing monitoring. These activities usually support APDLs. Their instrumental character makes these activities less determinant for independent living than the ones above described. Also in this category help is often necessary, but this hardly requires a full-time assistance and it can be more easily scheduled in time. Community (informal) care is a very important tool to help the elderly in coping with ADLs. There is also room to increase the potential of community care by technology.

Outdoor ADLs
Outdoor ADLs are especially important in supporting the social life of the older individual. As already pointed out this is also important to enhance the capacity of the elderly for independent living as well as their well-being. Mobility plays an important role here.

Outdoor APDLs mainly refer to the personal ability to move, like stepping on the public transport, walking, carrying (heavy) bags, climbing steps and short stairs, or slopes. Impairment in these abilities strongly affects the outdoor behaviour of seniors. Alternatives can hardly be found in the community, while some types of technological appliances give support to cope with these outdoor mobility impairments.

Outdoor ADLs refer to (cognitive) abilities like finding the way, crossing roads, or using public/private transportation, and to activities like shopping and banking. They may also include leisure time activities with a social scope such as gardening, visiting friends, going to the theatre or to the cinema, tourism and open-air recreation. This last category of activities will be dealt with in the next section.

Other activities that are relevant for elderly people such as visiting a doctor, a post office, or a governmental building, cannot be considered as an ADL since they have not got the requisite of a certain continuity. They are activities performed occasionally that the elderly may be constrained to carry out by a specific situation and for which some help can be necessary. Going to the doctor for a periodic health control, for instance, can become a problem for the disabled elderly in the case that the community cannot take care of this need.

In these activities it is possible to distinguish two parts: a functional part, and a recreational part. In older age the importance of the recreational part grows.

The functional part of the activity is directed toward the satisfaction of a functional need, as, for instance, the purchasing of food or clothes, the checking of a bank account or the withdrawal of money, the periodic control by the doctor, the asking for forms or buying stamps. This is the primary scope of the activity.

Besides this there is the recreational part of the activity which may be more relevant for the elderly. Visiting a facility may also have a social significance alongside the functional one. Having a short chat about prices or the weather by the butcher, keeping informed about goods and novelties may become the real purpose of the visit, and this is especially true for those elderly persons experiencing some isolation or loneliness.

5.5.4 Leisure activities and social participation
Leisure activities and activities aiming for social participation, like gardening, visiting friends or relatives, going to the theatre or to the cinema, tourism, open-air recreation, joining meetings of clubs or associations, can be also included in the number of ADLs since they are characterised by a certain regularity in time. On the basis of the new emerging conception of health and well-being in older age, it can be affirmed that these activities play a very important role for the quality of life of elderly people. They improve self-esteem, help in remaining aware of social standards, they stimulate confrontation and mental application through discussions, keep people busy and interested in things or actions keeping away depression and apathy.

These activities are often instrumental for social participation. Impediments in performing these activities are likely to result in exclusion from social life, which in turn bears negatively onto the ability of the older individual to continue to live independently.

Leisure activities and social participation are usually associated with the availability of time. In older age,
especially in consequence of retirement, time-budgets increase making more time available for leisure activities. But, this greater availability of time is somehow compensated by the growing importance of other factors and constraints, like climatic conditions and spatial hindrances. On the other hand, the 'good' part of the time becomes shorter, as certain hours of the day and of the evening may become unattractive for seniors, or as the season does not allow the elderly to spend time outside. Data from time-budget research conducted in different countries (Altergott, 1989) has shown that leisure activities are increasingly performed indoors as age increases. This clearly depends on the impediments that older individuals face when confronted with the (outdoor) context, impediments that are caused by the ageing process.

On the basis of time-budget studies concerning leisure time, Teague (1991) summarises a number of relevant points regarding the expenditure of leisure time in older age. "First, with age there is a decline in leisure activities that demand strenuous physical outputs; for example competitive sports and running. Older people spend more time in passive and sedentary activities, for examples reading and television. Second, outdoor related activities decrease while indoor related leisure activities increase. Third, more older adults than younger adults tend to engage in family and non-family social interaction activities. Fourth, older adults with more income and higher education participate in a greater diversity of leisure activities with fewer constraints and draw more satisfaction from leisure activities. Finally, the more active an older adult is in leisure activity, the higher the perceived level of health".

Teague again quoted research (from Singleton, 1987, based on quantitative surveys among three different age groups, from 18 upwards) from which it emerged that notwithstanding a decrease in the number of activities performed the most popular outdoor recreational activities were very similar in all age groups. Teague's conclusion was that "these findings support the contention that leisure preferences and patterns established earlier in the life cycle tend to be fairly resilient to the passage of time".

Although this data shows that leisure activities are mainly performed indoors in older age, the demand for outdoor activities remains a significant one, also due to their social relevance. Furthermore, the improving of the average health and cultural situation and of knowledge (also due to mass media) will probably lead to a growth in the demand. The conclusion above reported about the resiliency of leisure patterns also supports the expectancy of a growing demand of outdoor leisure activities. The elderly of the future will be more used to pursuing an active and significant outdoor behaviour supported by a high capacity of mobility than the elderly people of nowadays. Already, data from the Netherlands (SCP, 1996) shows that the use of leisure time by elderly people is changing in later years, and it gets ever more similar to that of the younger generations. Increasingly seniors spend their leisure time in outdoor activities such as going out for a walk, doing sport, joining social activities. Relevant social activities refer to church memberships, voluntary associations, politics. Here, the possession of a car is a most important factor.

The interest in educational and cultural activities is also rising, beside more traditional leisure activities like entertainment or hobbies. This depends, in part, on the better situation (economic, cultural, health) of elderly persons of the present, and in part on the improved availability of information.

5.5.5 Caregiving and social networks
The potential for community care is a very important issue in promoting alternative policies. Independent living and social participation often depend on some degree of support from the community. When this is not available institutionalisation of the frail elderly is often unavoidable. The most important source of care in the community is the social networks that surround the elderly. The participation of the elderly in these networks is twofold: although much research tends to focus on the position of the elderly on the receiving side, seniors also contribute to the networks in different ways. The case of the elderly person being totally and completely dependent on others seldom occurs.

As well as the informal caregiving supplied within social networks, there are also formal caregivers in the form of specialised organisations, state owned companies, hospitals and nurseries, or voluntary organisations such as church or civil associations. In this section the focus is on informal caregiving and the role of social networks.
All the necessary care that older individuals may need is often given within the social networks surrounding them. Family members such as husband/wife, siblings, children are the traditional caregivers, with women in the first place. But, friends and neighbours also increasingly play an important role, as families and householders get smaller, women participate even more in the labour market, and family members locate their dwellings at significant distances. Social networks are no longer limited to the family of the person, but friends and known persons also play a role, as well as other persons with whom one may have more or less continuous contacts.

In a recent survey (Tilburg, 1995) about social network delineation 59.4% of relationships mentioned by respondents were with kin (partners excluded). In the same survey respondents were able to indicate an average number of 13.4 relationships per person, with a maximum of 77 relationships. The most frequently mentioned relationships were with children and children-in-law (i.e. partners of children).

Intergenerational relationships are very important in social networks. Surveys in the Netherlands (Dykstra & Knipscheer, 1995) show a prevalence of three-generation families (54.6%), but also a significant 11.9% of one-generation families.

Cullen & Moran (1991) showed a table in which they adapted the typology of support networks produced in the UK by Wenger (1989). Here five main types are mentioned: local integrated; local self-contained; wider-community-focused; family-dependent; private restricted. This typology is reported in box 3.

Caregiving may refer to a broad range of situations, from essential daily living activities (thus continuous) to more occasional support. The most important are those activities concerning intimate care, as toileting, bathing, or dressing. Impediments in performing these essential activities affect the capacity for independent living by a person. Assistance in these activities may be burdensome for the caregiver, due to their intimate character, especially for the informal caregiver. Some other kinds of intimate care may require some skills, such as for the very frail elderly. On the other hand, the disabled elderly may dislike receiving assistance with

| Local Integrated | Typically include close relationships with local family, friends and neighbours; usually based on long-established residence and active community involvement in the present or recent past. |
| Local Self-Contained | Typically have arms-length relationships or infrequent contact, if any, with local kin, relying mainly on neighbours. Respondents are characterized by a retiring nature and largely privatized household-centred lifestyle. Community involvement, if any, is low key |
| Wider-Community-Focused | Typically including distant kin, with high salience of friends, some neighbours; characterized by high level of community activities and involvement, usually with absence of local kin. |
| Family-Dependent | Typically has its primary focus on close local family ties with few peripheral friends or neighbours. These are often based on shared household with, or living close to, adult child (usually a daughter). |
| Private Restricted | Typically characterized by absence of local kin, other than spouse in some cases, and limited contact with local community. No local friends and superficial contact with neighbours. |

box 3
Source: adapted from Cullen and Moran (1991)

these intimate activities, and this especially refers to more formal kinds of help or to less well-known persons.

Informal caregiving aiming to give support in a number of situations is a very common phenomenon. Cooking, cleaning the house, laundry, ironing, doing shopping are examples of more continuous assistance that the informal caregiver offers. This may also extend to more occasional situations, such as changing exhausted bulbs or doing repairs in the home, or helping in household management.

Another field refers to the carrying out of tasks in the outdoor environment, as the above mentioned food shopping or less continuous obligatory activities such as banking, going to the post office or to a governmental building, to the pharmacy, and the like. Here caregiving can result in substitution, undertaking the task instead of the disabled elderly person concerned, or in supporting, that is, accompanying the elderly person, thus giving
mobility support and / or support for eventual problems in coping with the activity. Supporting the mobility needs of the elderly has a positive influence upon their social participation in addition.

Caregiving may also refer to keeping the older individual under control. Family members are often concerned about what may happen to their older relatives who live independently. They may fall and lay on the ground until someone comes to give help, or they may be not in a state to escape when a serious accident threatens them (e.g. fire). They want to be sure that if something happens it is possible to provide immediate help. On the other hand the elderly also like some kind of control. This helps them in feeling more secure and safer in their domestic environments, thus positively contributing to independent living. However, the manner of control and the degree of control may arise ethical problems since it involves privacy.

Finally, caregiving can sometimes be meant as common companionship that aims to give the elderly socio-emotional support. This is especially important in difficult periods, particularly as a consequence of bereavement, when seniors may feel alone or they need to re-organise the social networks around them. Diminishing mobility may lead to social isolation, with negative effects on the older individual’s well-being.

On the other hand elderly people are often contributing elements in their families and to society (Knipscheer et al., 1995). As already said, they fulfil important functions by spending their time for the advantage of their relatives. For instance, they may go shopping or paying bills for the other members of the family with less availability of time, or they can take care of their grandchildren or of other elderly persons. Sometimes they also contribute in solving economic problems within the family, by making available part of their allowances.

The relationship between the elderly persons and their younger caregivers, especially when both belong to the same family, is also a way in which the elderly contribute to cultural life by operating a transfer of their experiences and knowledge to younger generations (Hirshon, 1991). This ‘memory transfer’ has been for centuries the most important vehicle of cultural transmission among generations, once taking place during and after dinner, at the end of the workday, or at work. Nowadays caregiving is one of the few ways remaining to let this transfer happen.

5.6 The Potential of technology

Technological developments may help in coping with the situations outlined above. The three key points identified in a previous section give the basis for assessing the relevance of technology in respect to life in older age. The potential of technology should be therefore considered in reference to its capacity of enhancing independence, of increasing social participation; and of improving community care potential. To achieve this, it is important to assume an ethical perspective: any solution should be directed towards the improvement of quality of life of elderly persons, and, as well, it should be in accord with their desires. The contribution of technology in reaching the above mentioned goals refers not only to very advanced technologies like robotics and telematics (high tech), but also to low- and medium-tech (Haber, 1988; Cullen & Moran, 1991).

- Low technologies concern objects of use in everyday life, like utensils or housing furniture, as well as adjustments of the lay out of dwellings and residential areas.

- With medium technologies we understand developments in e.g. householder appliances improving their performance and their user-friendliness.

- High technologies may make life easier by substituting many heavy tasks of householder management as well as improving safety, security and control. At the same time they may make life more complicated, too, since they often involve a very different way of organising life and carrying out activities.

For clarity it should be stressed that technology can be designed and used to help the caregiver as well.

Most of the problems of elderly people in their everyday life can already be solved by adopting a conscious design of low technologies. A different design for most common utensils e.g. for eating and drinking, or another lay-out of places and spaces may be enough to improve
the capacity of elderly people to cope with the environment. High technologies will be useful to help the very frail elderly persons or those ones with specific problems impeding them from pursuing a desired behaviour. However, the same technologies should be made attractive and useful for other social categories as well in order to avoid the risk of targeting the elderly through the design.

In particular, telematics have a great potential especially concerning both the functional independence of elderly people and improving their social participation. The adoption of advanced equipment can help the elderly in choosing whether to continue to work after retirement or to be involved in a potentially large number of leisure and recreational activities. The choice of the cultural options can be also facilitated by telematics, as well as the retention of the ability to carry out several ADLs.

At the same time a number of problems can be seen in relation to the adoption of advanced equipment by the elderly person. On the one side older persons tend to be sceptical or afraid in relation to advanced technologies, and to refuse them. This is also true for artefacts specifically designed for them and only for them, by using which they may feel targeted. On the other side, the improvement of the degree of independence of the elderly and of the capacity of control of the caregiver may result in increasing social isolation. This risk is especially present when we consider applications of information and telecommunication technology.

Technology has to be analysed with the view of minimising risks and implementing opportunities. Therefore, technology must be assessed in the direction of its real utility in relation to the needs of older persons, and of its economic and contextual affordability. To this end, Cullen & Moran (1991) propose the so-called constructive technology assessment approach. Two sets of criteria are chosen to operate such assessment: needs of the elderly; and the characteristics of the caring systems in the community (formal and informal).

The needs of the elderly and their contextual characteristics are the main criteria of the framework of technology assessment elaborated within the TIDE – ASHoRED project and reported by different authors (Björnoby, 1994; Horelli & Leppo, 1994).

Technology can help the elderly to solve or to lessen their problems in relation to the environment. Its potential should be assessed in relation to the three key points defined in a previous section: independence; social behaviour; community care. In the next section we are going to take a look at the potential of telematics for life in older age in relation to these three dimensions.

5.7 Telematics applications for the aged

What does the information society offer to older individuals? Like other low-, medium-, and high-tech technologies, telecommunications can be useful in helping senior citizens to cope with the context when problems arise and to facilitate the performing of desired behaviours by them. Access to telematics networks can be a resource for a better life, and this also applies to life in older age. The previous chapters made clear that less favoured categories of people may receive many benefits from a correct introduction of telematics applications, but these possibilities are not supported enough from the direction of market evolution since elderly people are not yet considered as a profitable segment in the market. However, awareness is rising among institutions about the positive potentialities of telematics both for the well-being of older individuals and to cope with the societal issues of an increasingly ageing society.

The inclusion of senior citizens in the information society must take into account five 'A' factors that are crucially important for the balance between positive opportunities and negative implications (PROMISE, 1998). They are:
- Availability
- Accessibility
- Affordability
- Awareness
- Appropriateness

Availability refers to both the use of telecommunications equipment and the offer of relevant services by institutions and companies. Although many services targeted on elderly people are presently available, as will be described below, a greater effort should be made to make a larger number of services actually available to older users. It seems important to stress the relevance of not segregating services according to category of users, but trying to realise as far as possible integrated services.
Accessibility refers to the form and the way telecommunications products and services are offered to the public. The design of equipment and services is often a constraining factor for the older person who wants to access the networks. The needs of elderly people, and especially of those persons experiencing some kinds of cognitive impairments or visual and hearing limitations, are hardly considered in the design of technologies. Design for all is a basic concept that should be promoted also in the virtual world.

Affordability refers to the cost of equipment and of access to services, as well as maintenance costs. These can become very relevant barriers for elderly citizens, traditionally not a wealthy social category. On the one hand market competition will contribute to lower costs, but on the other hand this will hardly be enough to ensure a greater access of elderly people to the newer technologies. For instance, specialist equipment is very expensive, as in the case of Braille users. It is important to develop policy measures in this area.

Awareness applies to both people and suppliers. Lack of familiarity with the new technologies and telematics services are relevant barriers for elderly people towards their participation in the information society. Elderly people are hardly aware of potential benefits and risks of accessing telematics networks. Those actors in charge of promoting participation in the information society also show a scarce awareness of the problems of elderly people in this context.

Appropriateness of services and applications in relation to specific circumstances and problems is an essential factor to consider. The involvement of end-users in the design, development, and evaluation of products and services is important. Like any technology, telecommunications can also produce negative consequences when not enough attention is paid to the assessment of possible social impacts.

The potential of the information society for senior citizens depends upon these five factors. In particular, the lack of necessary resources can threaten the positive effects. This refers to both economic resources; how affordable the necessary equipment is, and skill resources; the ability to use the equipment. The relationship with advanced equipment can be made more difficult by declining cognitive capabilities, as in the case of Alzheimer’s disease. Others may refuse the use of advanced technologies because of e.g. psychological motive – even if this problem is likely to lose relevance for the newer elderly cohorts. On the other side, another factor to take into consideration is the design and user-friendliness of equipment, which influence its attractiveness.

Items of appropriateness of services and applications are relevant in discussing the use of telematics applications by elderly people. This can be done by taking into account the three key points outlined earlier in this chapter – independence, social participation, community care – in relation to the specific problem area.

5.7.1 Telematics applications for health
There is a variety of technologies that can be relevant and helpful for the older individual. Some of these are targeted on the frail senior, while many others can be enjoyed by everybody. Many telematics applications aim to improve the ability of the aged to carry out independent life styles by reducing the importance of (early) physical and cognitive limitations caused by the ageing process. Applications of tele-health care and tele-medicine are particularly important in this context.

The European Community R&D Programme Advanced Informatics in Medicine defines tele-medicine as “the investigation, monitoring and management of patients and the education of patients and staff which allow ready to expert advice and patient information no matter where the patient or relevant information is located” (AIM, 1991).

Veneris (1992) defines tele-health care as “the provision of telematics services and related goods which can provide tele-medicine services, assist in raising the consciousness and in increasing the involvement of both the individual and the community towards the total health environment, aiming to improve the well-being and the wellness”.

Tele-health care and tele-medicine can make possible the remote monitoring of those elderly people affected by chronic diseases or which are likely to face health problems. Control may refer to a variety of situations, from the medical check ups – screening, diagnostics – to surveillance, from drug prescription to health services.
education (Veneris, 1992; Gott, 1995). According to the service required or needed, and, thus, the relative equipment, and the type of medical case there are different possibilities for introducing the application of telematics in the health sector in the context of the home care option: in the house of concerned people (patients, carer) or in specialised centres in the residential area (Caso & Tacken, 1993).

There are different medical sectors in which telematics applications can be usefully employed. We can make a distinction between education, prevention, monitoring, diagnostics, therapeutics, and rehabilitation (Cullen & Moran, 1991).

— Education and prevention are mainly related to the information the user has on medical items. This refers in principle to the senior, but also to the (informal) caregiver. Educational programmes and on-line accessible information can improve this knowledge both in general terms and at the moment of need. Telecommunications can make this task easier.

— Monitoring can be especially important in old age due to the prevalence of chronic diseases rather than acute diseases. This applies particularly to the frail individual, who may need to be continuously monitored. Telecommunication offers an alternative to institutionalisation, allowing the remote monitoring of vital signs. Remote monitoring can be also useful for the surveillance of Alzheimer’s disease patients.

— Diagnostics can be remotely performed through telecommunications systems. This also needs special equipment in the home for the gathering of data to be sent on-line to a remote place such as a hospital or a doctor. Here a video connection like the video-telephone or teleconference may be useful to support diagnostic processes.

— Telecommunication in therapy mainly refers to information and the recalling of time schedules. This can be helpful for both the patient and the caregiver.
— Rehabilitation is a significant medical sector for elderly persons. Telecommunication in this field can make getting information easier. Cullen & Moran (1991) suggest the use of the video-telephone to deliver training programmes. The same could be done with teleconferencing. To the same end it will be possible to make use of specialised TV programmes (e.g. in pay-per-view system) targeted upon the specific need of the person.

Applications of tele-health care and tele-medicine can be very important for elderly people especially for that which concerns their independence. At the same time the community-care context also enjoy better tools to give the necessary care to seniors both formally and informally.

5.7.2 Telematics applications for security and safety
An enlarged definition of health in older age includes items of security and safety as these ones consistently bear onto the well-being of individuals (Cullen & Moran, 1991; Veneris, 1992; Gott, 1995; PROMISE, 1998). Because of their specific importance for seniors and caregivers we deal with these items in this section.

Security and safety refers to a broad range of situations, as mentioned in a previous section of this chapter. The main items refer to psychological security, risks of accidents, fear of being assaulted or robbed, personal emergencies, burglary. For all these items a variety of technologies is available. Telecommunication can play a very important role in this field. Mostly the applications relate to a variety of alarm systems that can be environmental systems or personal systems. Environmental alarm systems are used for the control of the environment; personal alarm systems relate to the individual. Environmental systems are generally made up of a number of sensors that are able to detect and often understand environmental changes. The data is sent to a central unit, which sends out an appropriate response. Personal systems usually consist of a portable trigger that can be operated by the person in case of need. It is connected to a central unit, which can alert the service concerned or a relative.

— Psychological security can be greatly improved by the consciousness of being ‘protected’ by alarm systems, or by being aware of being remotely ‘controlled’. Possibilities to interact with the social network are also effective ways to enhance feeling of security and safety. Video-telephone and tele-conferencing can be relevant tools in this re-assurance function.
— Alarm systems can intervene in case of accidents such as domestic fires, by alerting both the individual and the service concerned — in this case the fire department. Other systems regarding environmental problems relate to alert systems against undesired intrusion.

— Personal alert systems can be used in the case of personal accidents such as falls or in the case of emergencies, either indoors or outdoors. The alarm can alert a dedicated service or a relative, leading to immediate help. The same system can be used in the case of assaults to the person. It cannot protect the assaulted person, but it can very rapidly summon help. Another use of the personal alarm system relates to demented persons who can be kept under control more easily to avoid the typical problems connected with their disability.

— Alarm systems also have a reassuring function for the caregiver. The informal caregiver may enjoy telematics applications to conciliate their daily tasks and activities with the care of their older relatives. They can keep an eye on them from afar, while remote monitoring of housing functions combined with smart home technologies can reduce the risk of domestic accidents, improving at the same time the feeling of security and safety of the elderly person (Cullen & Moran, 1991).

— Safety on the streets can be improved by tele-surveillance especially in those areas with criminality problems or housing a denser elderly population, but this is a controversial item due to the potential threat to individual privacy (Graham & Marvin, 1996).

Alarm systems also raise a number of problems. In first place there are ethical questions related to the personal surveillance. Tele-surveillance may reduce privacy and should, therefore, be used only in extreme circumstances and, if possible, in agreement with the person concerned.

Other problems relate to the fact that triggers are hardly attractive to wear and are often annoying objects. This can be also considered as a design problem. More serious is the problem related to their use in emergency. Very often elderly people are confused during an emergency and do not realise that they just have to press the button.

Alarm systems are a very important support for independent living and for the caregiver; but they are not a definitive solution. They can also have a reassuring function for the outdoor behaviour of the elderly, consequently facilitating social participation.

5.7.3 Telematics applications for ADLs
A great number of technologies is available to support the daily living of older individuals. For the frail ones, experiencing problems with the most basic personal and instrumental ADLs, many low-level technologies can be determinant, like a different design of dwellings or a different lay-out of utensils. High-level technologies in this field relate to robotics and integrated environmental control systems. Here telecommunications are useful for information gathering as well as a support for householder management.

In the category of environmental control systems we can include integrated and inter-active smart home technologies. This makes possible the integration of (remote) services with a number of high- and medium-level household appliances. For instance, it makes possible the remote reading of the meters, the control of the indoor comfort by setting the right temperature and light environment, the operation of a number of domestic appliances such as washing machines or cookers from remote locations — especially for the benefit of caregivers. Alarm systems, both personal and environmental, can be better used in an integrated smart home environment. It makes it possible to perform a number of activities from home, including a number of leisure activities that we will deal with in a later section.

The intervention of telematics is more relevant in this latter field, concerning the relationship between housekeeping and outdoor environment. Tele-shopping is the most prominent example here, but also all those activities for which the individual is forced into outdoor mobility — such as banking, going to the post office or to a governmental building, or going to the doctor (see telematics for health section) — which can be done or facilitated by equivalent tele-activities.

Of course, these must be considered as complementary possibilities, not as absolute substitution. Tele-shopping can be an alternative to traditional shopping in the cases...
5.7.4 Telematics applications for leisure activities and social participation
Leisure activities and activities aiming at social participation are an important group of activities also in old age. A greater availability of time and decreasing social contacts due to the ageing process and retirement support this importance.

As we remarked in a previous section, leisure activities are increasingly performed indoors as people age. At the same time the demand for outdoor leisure activities for the third age is rising, also due to the better health, cultural, and economic situation of elderly people nowadays. Of interest also are findings reporting the resiliency of leisure time activity patterns in relation to ageing (Teague, 1991).

Indoor leisure activities can be greatly enhanced by telecommunication. A great number of applications is available or possible in this field. To mention but a few, applications may refer to education, home entertainment, culture, home-work.

Many elderly persons will still desire to improve their education, just for personal satisfaction or in order to start a different activity. Retirement will give them more time to engage in educational programmes. These programmes, grouped under the name of tele-education, may be delivered on-line at home through a variety of media: computer networking/teleconferencing, TV programmes, and pay-per-view.

Home entertainment will probably be the most widespread group of leisure activities. Many of these will be not supported by telecommunications although they may be performed with the help of advanced technologies. Watching TV or reading books will probably remain the most popular leisure activities in old age, but the introduction of telecommunication will open up a new range of possibilities making possible inter-action with remote subjects. The same TV programming may be influenced by the possibility of allowing other persons participate remotely, but the greater evolution can be expected in the field of computer networking. For instance, the possibility to play a chess game with someone located elsewhere, or a new generation of computer games to be played on a
network. Surfing in the Internet is another activity that is becoming increasingly popular also in the third age.

Leisure activities of cultural nature will also be possible for the older individual. If going to the cinema or to the theatre, or visiting museums and expositions will get more difficult because of age-related problems, these events may be brought to the homes of people by telecommunication, probably via a pay-per-view system or computer networking. This also depends on the quality of screens and sound, thus integration with HD televisions will be a facilitating factor. Already many events are broadcast on the Internet, while R&D concerning HD television and pay-per-view is allowing for fast progress in these applications.

We also mentioned homework, as a potential activity made easier by telecommunication. Especially the young elderly may use time made available by retirement for other (part time) work activities. Another reason will probably relate to the social relevance of work. This will probably be a choice that more elderly people will make in the future.

Outdoor leisure activities and participation in social activities/events will mostly depend on the individual’s capacity for mobility. Availability of transportation (better if private) or an alternative system, – like an accompanying person – are determinant for these kinds of activities. Here telecommunication may be useful for the gathering of information about transportation modes and about events, making easier the performance of outdoor activities (Tacken, 1993). Other kinds of information that may become relevant for the older individual is regarding the monitoring of outdoor environmental conditions, like weather, wind, or level of air pollution.

Cullen & Moran (1991) remarked that success in the introduction of telecommunication for leisure activities depends on the ability to integrate social with (e.g.) educational and cultural programmes.

Many of the possibilities mentioned are relevant for the participation of elderly people in social events. This helps to keep a person up-to-date with the evolution of the community(s)he lives in, even if sometimes by means of virtual participation or participation from afar.

5.7.5 Telematics applications for caregivers and social networks
Telecommunication can be an important complement for caregivers. Previous sections have made it clear that telematics applications make possible a better control of the situation and a more rapid intervention in case of need. Continuous physical presence and assistance is no longer necessary, since remote intervention through integrated smart home systems, for instance, can solve many problems and emergencies. In this way the (informal) caregivers could be able to supply the necessary care to their older relatives while continuing to pursue their daily activities. Smart home technologies can also be remotely operated with the aim of carrying out some other tasks of caring. A relevant application could be the surveillance of demented elderly people or the aged persons experiencing early cognitive problems, who do not like any physical control, but may accept this sort of more virtual surveillance (Bjørneby, 1994). At the same time, specialised resources in different fields, such as medical staff or technical personnel become more easily accessible from any location.

Some telematics applications can have a positive influence on the participation of elderly people in social life. Many telematics networks dedicated to the elderly, as the Seniornet, the Senior Link, the SCIP (Seniors Computer Information Projects), or the Friendly 4 Seniors – all sites available on the Internet together with many others – have seen the light throughout the whole world, and especially in North America. They provide the aged and caregivers with useful information on a variety of items, from legal to medical or technical, and occasions for social exchange such as chat-lines, home pages, and event information as well as leisure time activities. Instant messaging systems can help in building a virtual social network. Video-telephony can become an important tool for the elderly experiencing problems of constrained mobility (Cullen & Moran, 1991; Gott, 1995). Other applications are helpful for people experiencing visual or hearing impairments, like text telephony, Braille text converters, or again video-telephony facilitating lip-reading (PROMISE, 1998).

However, telecommunication cannot be considered as a substitution for social relations. It should be considered mainly as a complementary medium to foster social relations rather than to substitute for them. One most
important function of social networks is socio-emotional support, especially in difficult times. On the other side the same elderly persons may be of support to their relatives.

Indeed, most of the potentially negative side effects of telematics applications refer to the social environment. For the frail elderly, experiencing problems of mobility or of declining cognitive capabilities, introduction of telematics applications for a number of tasks traditionally performed by caregivers can become a double-edged sword. For instance, surveillance no longer requires physical presence — since it can be remotely performed — thus potentially resulting in more isolation in spite of the increased communicative potential enabled by telematics (Cullen & Moran, 1991; Graham & Marvin, 1996). At the same time, the physical performance of activities such as shopping or banking implies a social valence for the performer which can be very attractive especially for those elderly who experience a certain degree of social isolation.

The applications of telematics discussed in this section are particularly relevant for concerning social participation and the community care context. Here a potential risk for social relations has been highlighted. Especially concerning the older users of telematics applications, alternatives in the vicinity of their dwellings should be always present to facilitate physical contacts. This particularly applies to those frail elderly with limited (physical and/or cognitive) resources. The risk of getting socially isolated is real especially for these categories.

5.8 Summary and conclusions

This chapter focused on the phenomenon of the ageing society. Elderly people are one of the social groups that are in danger of being excluded from the advantages of the 'information society'. At the same time, the time-space characteristics of telematics are well suited to improve quality of life in old age. The 'tele-activities' we reviewed can be useful in helping the elderly to overcome some of the problems of life in old age and to facilitate the performance of desired behaviour. The possibilities and risks of telematics applications have been presented. An important factor is the location and accessibility of services in relation to elderly people. On the basis of the information given in this chapter, it is possible to gain a better insight into the situation of elderly people in a real socio-spatial context. This will be done in the next chapter, where the findings of the survey we conducted in the area of Meerzicht-Zoetermeer will be presented.

Notes

1. In the case of the ‘middle variant prognosis’
2. BESTA is a Norwegian project in which a number of institutions and companies co-operated to develop and evaluate integrated smart homes which should allow different types of elderly persons to age at home. Central to this project is the concept of life cycle housing.
3. CIGL, CISL, UIL count together about 11 million members, about 5.5 m. of which are pensioners.
4. Research has demonstrated that elderly drivers are involved in traffic accidents much more often than younger drivers.
5. Cullen & Moran (1991) explain the constructive technology assessment approach by means of the following two quotations: (it aims at) ‘tracking down, formulating and developing desirable technological applications for society’ (Smits, 1990) and ‘analysis so that the mis-matches, the wrong investments and possible social conflicts can be minimised, while at the same time the beneficial effects and opportunities can be fully exploited’ (OECD, 1988).
6. Survey in Meerzicht Zoetermeer
6.1 Rationale for the survey

As we discussed in chapter 1 the operators at the first two levels of the network city model configure a set of possibilities for the performance of activities, from which the operators at the third level, the users in their daily behaviour, choose the most convenient for their tasks. The first two levels are more 'objective' dimensions in the city, while the third gives a 'subjective' interpretation of these possibilities.

Considering the relationship between 'objective' and 'subjective' dimensions is an essential step in the design process. The possibilities for certain behaviour are inherent in a specific setting by the position and structure of its physical elements and by the type, quality, and accessibility of the services offered, and also by social conditions. When an individual wants to perform a certain action, (s)he is confronted with this range of possibilities that condition the final choice. If the elements that constrain the availability of different possibilities are dependent upon the specific physical and socio-functional structures of an area, the motivations leading to a certain choice instead of another one are essentially a personal matter.

It is, therefore, important to acquire data on the relation between individuals and their surrounding socio-spatial context to see what possibilities are available and how these are interpreted and used by people (Zeisel, 1981; Yin, 1989 & 1993; Hamel et al., 1993). To carry out this step it is necessary to observe a real situation in an existing socio-spatial context in order to deduce a set of data as basis for confronting it. Therefore, it is important to try to understand which possible developments and technological applications fit into the desires of the people concerned and their community, and how these possibilities can be organised and introduced in a socio-spatial setting with the task of satisfying current and future needs, and expectations.

We conducted a field investigation in Meerzicht, a neighbourhood in the Dutch city of Zoetermeer, about 10 km. from The Hague in the direction of Utrecht. For the reasons described in the previous chapters we decided to focus on the social category of the elderly as the target group for the fieldwork. The goal was to detect eventual impediments and desires experienced by seniors in a real socio-spatial context, and the possibility of using telematics in this respect. The field investigation consisted of a survey about the actual situation of elderly people and their needs in the Meerzicht area, and will explain how the physical, social, and functional contexts of people influence their spatial behaviour.

6.2 The structure of the survey

The field investigation has been conducted with the use of a questionnaire and a diary of daily trips. The first problem we had to face was the design of the questionnaire (Caso, 1997b). Indeed there are very few applications of telematics that are commonly used by the elderly, and this does not allow obtaining direct information by interviewing elderly people about these specific items. Therefore, we decided to follow an alternative path in trying to gain more insight on the real situation of elderly people in their socio-spatial context. Our main aim was to identify those factors which impede the elderly to perform a desired behaviour, and which applications of telematics might render less problematical.

To this end, a basic aspect to take under consideration refers to the concept of the quality of life in old age. In general the degree of quality of life in a certain context depends upon how far that context allows an individual to satisfy his/her needs: overcoming problems and realising opportunities. Focusing on the relations between person and context, quality of life can be defined as:

"the multidimensional evaluation, by both intrapersonal and socio-normative criteria, of the person-environment system of an individual in time past, current and anticipated" (Lawton, quoted in Fernie, 1991).

Fernie (1991) also points out the existence of two different parts to define quality of life, by remarking that: retention by the individual of the ability to make choices and community standards are the two most important parameters of quality of life in old age. On the one hand we have the person, with its qualities and limitations; on the other hand we have the environment with its characteristics.
The confrontation between person and environment gives the degree of accessibility of a particular socio-spatial setting in relation to a specific individual. It can be easily seen that the availability of more alternatives amongst which a person is able to operate choices is an indicator of the quality of life in a certain context. Therefore, we focused our attention on the definition of those elements which intervene in the choice of certain behaviour. This was made by operating a conceptualisation of an average activity pattern. We observed that people's behaviour is the result of a continuous confrontation between person and environment, and depends on both individual's psychophysical capabilities and contextual characteristics.

Activity patterns are processes that work towards the satisfaction of needs. Needs can be of a very different nature and have been defined from many different points of view. Maslow (1970) has proposed a classification of basic needs ordered in a hierarchy ranging from a lower level—such as physiological needs— to higher one—such as aesthetic need. The process which leads to the satisfaction of a given need—an activity pattern—involves three clearly recognizable dimensions: the place where the need is satisfied; the people intervening in the process; the 'things to do' to satisfy the need. Respectively the physical, social, and functional dimensions we have already found as we conceptualised the city as a system made of subsystems.

For instance: John has a medical need. To satisfy this need he will perform a health-care activity. This activity takes place in a specific location—a hospital, a health care centre—with the help of several persons—a doctor, a nurse, a receptionist.

The way in which the three dimensions are ordered depends both upon individual's priorities and contextual factors. For instance, the above-mentioned John may have some confidence in a particular doctor, or maybe one hospital is the most easily accessible from his home. It can also be the case that these specific services are best performed in that hospital, so that John will choose a 'functional oriented' activity pattern (see fig. 1).

The conceptualisation of the above described process leads to the identification of four different areas in which an activity pattern can be subdivided: one relating to the person, and the remaining three relating to the context. The personal element in the process can be described by means of a personal/psychological domain which includes age, gender, education, income, physical and cognitive capabilities, eventual impairments, and so on. Instead, the context has three components: the physical environment, the social environment, the functional environment. It is clear that the relationship that the personal domain has with each one of the three contextual environments can be responsible for impediments for the desired behaviour of the individual—the steps of a staircase are too high for the person; the usage of a service is too complicated for the person; the social context is too aggressive for the person.
The process of inter-action between person and environment involves two other most important dimensions in a mediating position: mobility and technology. These cannot be included in any of the four mentioned areas, but they are vehicles, media, through which these inter-relationships can come into being.

6.3 The structure of the questionnaire

The questionnaire has been designed according to the above mentioned conceptualisation. We thought it was of some interest to try to ensure the comparability of our findings with data from other research projects in this research area. In particular, the research project ‘Keeping the Elderly Mobile’ developed within the framework of the COST A5 ‘Ageing and Technology’ European network, seemed to have many points of contact with our project. In this project the central question concerns the explanation of items related to the outdoor mobility behaviour of the elderly, finding the critical features that condition this behaviour and developing technological solutions for the hindrances experienced by the elderly (Mollenkopf & Marcellini eds., 1997). For this reason many parts of the questionnaire have been made similar to the questionnaire developed in the mentioned project.

Part 1 contains questions on the physical environment, particularly on the scale of the neighbourhood and the dwelling, but also on the wider area. Part 2 focuses on the social environment and the degree to which it supports the older individual. Part 3 describes the functional environment of those interviewed; which services are present in the vicinity, their importance and the frequency of use. This part was enlarged by part 4, which includes questions on work and leisure time that are very important items also in old age. Part 5 makes the point on the capacity of mobility of older individuals, and contains questions on the personal transportation means and the use of public transport. In part 6 the interviewed give answers on their relationships with (advanced) technology: the use of automated tickets, microwaves, computers, and so on. Personal data as health situation, education, income, age etc. are dealt with in part 7 (health) and 8 (statistics). Each part contains a self-evaluation question such as “all in all, how happy are you with your situation?”, and other questions aiming to detect the alternatives employed when problems are experienced.

Additionally, the respondents were asked to keep a diary of their trips over two consecutive days. They reported the origin and destination of each trip they made, the transportation they used, the time taken by the trip, and a final evaluation of the trip by stating whether they encountered difficulties or not, and of which kind.

6.4 Area description

The survey took place in Zoetermeer in the district of Meerzicht, a neighbourhood of the city that has about 18,000 inhabitants. This neighbourhood was built in the late 60's and the 70's. The older part consists of high rise buildings surrounded by green areas. The newer parts have been realised as low-rise row houses on the border of a large park. The city-railway line crosses the whole area from north to south, with a station in the centre of the neighbourhood. Around the station a small shopping centre has been developed. In the same area a service flat for elderly people has been placed where they can live quite independently. They have their own front door and their own kitchen, but they can use some common facilities. This service flat offers day and night health-care assistance, a library, and a pharmacy. However, the central area is the most congested of the neighbourhood, and also the least pleasant one.

Other elderly inhabitants of Meerzicht live in dedicated housing spread over the whole area. These houses have
been built in very small clusters surrounded by the normal buildings of this area. The only difference in these houses is their scale: the number of rooms and the location of these rooms are all on the same level. The remaining part of the elderly population lives in the other houses and apartment in the area.

The residential function is the main function in the area, but there are many elementary schools as well. Another function that is present in the area is a sports centre. On the eastern side of the area, along the main city-road (thus, the most easily accessible area from the highway) a number of office buildings are located. A quiet street for slow traffic with a semi-rural aspect forms the northern border of the neighbourhood. This was the old road leading from The Hague to the original village. A large park occupies the western border with a recreational function for the whole city. A highway with the related buffer zone defines the border in the south.

6.5 The survey

The findings of the survey are reported in the following sections.

6.5.1 Selection of the sample

The municipal office of Zoetermeer has made a selection of all the inhabitants of 65 and older in the residential area of Meerzicht. The first sample consisted of 600 addresses. They received a letter from the municipality together with a letter from the researchers. This letter explained the aims of the research project and this was also a recommendation by the local government to participate in the survey. The letter included also a form with the request to people to fill in this form and to send it back to the researchers. In this way the anonymity of people was guaranteed. The researchers knew the address only with the agreement of the respondents. This made communication a little bit more difficult.
The letters were sent by the municipality in two waves. After about 10 days the people in the first selection, who did not react, were sent a reminder. And, after two weeks, the second wave received a first letter and after about 10 days they also had a reminder. This resulted in a response of 150 valid forms, 25% of the original selection. This response rate is rather low. The procedure for the selection of the respondents is most likely the main reason for this low response. Filling in a form and sending back is much more complicated than doing nothing. In the interviews we got an impression of other possible other reasons.

A first reason could be this specific age group. People have a high threshold to participate and some of them reacted in a way: “I have nothing to tell you, I am not very special”. Another reason was the mailing procedure chosen. There are contacts between people in such a residential area. People told each other about the interviews. The number of questions has built up a higher threshold. Furthermore, the partner in the same household could be part of a different wave and this resulted sometimes in non-response for the second person at the same address.

For the survey the researchers chose a personal interview and a diary of the trips made during two days. All persons, after their own response, received a phone call from one of the interviewers. He made an appointment for the interview. This interview took about one hour. At the end of the interview the respondent was given the request to fill in a trip diary during the next two days. The interviewer explained how to fill in this form. He also said that he would come back on the third day to collect the form and to check it together with the respondent. In case of problems they could fill in the form together. Sometimes, even this was too complicated. Then the interviewer personally filled in the form together with the respondent. They reconstructed the day before the interview and the interview day. This always concerned people with restricted mobility, which made this approach quite reliable.

6.5.2 The composition of the sample compared with the population
The realised sample consists of 50% males and 50% females. In the whole area this gender distribution is 41% and 59%. This means that we have an under-representation of women. This may have two reasons. When both partners were selected, they often made the choice to respond only for the male partner. The second reason may be that for technical reasons the second wave consisted of a larger proportion of women and the response was lower. For the explanation of the behaviour this distribution is an advantage (to have equal groups of both genders).

Personal situation
In the sample 37% is older than 75 and in the population this share is 38%, while respectively 7% and 6% are older than 85.

We measured the educational level by asking about the number of years spent in school. This is the only way to find an easy comparison with other countries. 66% had 8 years education or more (two years kindergarten and 6 years of basic school). 37% had at least two more years of additional education. In total 18% has visited schools for 12 years or more. For this generation this seems to be a little bit above average level of education.

Household status
In marital status (table 1) the differences between the sample and the population of Meerzicht as a whole are small, even when the sample is divided into gender groups.

Table 1 Marital status in the sample and in Meerzicht

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Sample total</th>
<th>Male</th>
<th>Female</th>
<th>Population total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>married</td>
<td>62</td>
<td>41</td>
<td>21</td>
<td>53</td>
<td>37</td>
<td>16</td>
</tr>
<tr>
<td>widowed</td>
<td>28</td>
<td>12</td>
<td>16</td>
<td>35</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td>divorced</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>single</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL N</td>
<td>150</td>
<td>75</td>
<td>75</td>
<td>1495</td>
<td>608</td>
<td>887</td>
</tr>
</tbody>
</table>

Source: UPRG survey in Zoutman-Meerzicht, 1996.

The difference in marital status between males and females in the sample is great. Many women are widows. This has been related to the higher age that women in the sample have, if compared with males. In the age group of 70 - 74 27% of the women are widows and 16% of the males are widowers. In the age group of 75 - 79 these shares are respectively: 70% and 13%.
43% has an income of more than 2500,- NLG per month, while 20% has less than 1800,- NLG. 25% has an income between 1800,- and 2500,- NLG. These amounts concern the basic income for 1 and 2 person households. The elderly people are quite satisfied with their financial position with a share of 52% that gives a score of 8 or higher. The average score is 7.5.

**Figure 4**

<table>
<thead>
<tr>
<th>Satisfaction with the financial situation</th>
<th>people of 65+ in Zoetermeer, Meerzicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>low</td>
<td>1 2 3 4 5 6 7 8 9 high</td>
</tr>
</tbody>
</table>

The housing of the people in the sample was 3% in a detached house, 43% in row houses and 52% in multi-storey housing.

**Conclusion**

As far as we can check the composition of the sample, the main characteristics are not totally different from the whole population of this residential area. The largest difference concerns the lower participation of women in the sample, but this is no problem for the explanation of some items. However we have to be careful in generalising the findings for the population of Meerzicht.

**6.5.3 Social relations**

For the life situation of the elderly it seems to be very important whether they live together with other people. It offers the opportunity to do some tasks together and to divide the tasks between more people. 33% of the respondents live alone, 61% live with a partner, only 2% live with a brother or sister and 5% live with other people. One third of the sample live alone. This can influence the way people perform several domestic duties. 58% live together with a partner and only 5% live together with son or daughter.

Most elderly people do not have problems with these domestic duties. Cleaning is the one most often left to other people, even if they have a partner. For the small group with problems a relationship to health can be expected. A very clear parallel exists between the number of help items mentioned by people and the satisfaction with their health. People without any need for help evaluated their health with 7.6 as good. But, people asking for help for one item have a satisfaction score of 6.7 which is steadily decreasing with the number of help demands. The mobility capacity is relevant here. The more negative people are about their mobility, the more they need help for domestic duties.

A relationship with age, which also is strongly related to health, is no surprise. In the age group of 65 - 74 27% asks in some aspects for help, but this share is 79% in the age group 75 and older. In gender terms the findings are totally different. More females are asking for help (39% against 56%). Two obvious reasons can be found. Females are getting older and they are more often living alone for the same reason.

Table 2 is a product of the Dutch care system. Problems with personal care are an important part of the indication for institutional living. For this group of independently living elderly the share of people who need help will be low. The most common need is that people get some help for cleaning. The other domestic duties will be done by themselves or by a member of the household. Only for doing odd jobs people will ask help from others. This is the normal situation, but what will happen, if they get ill?

**Table 2 The need for help with some domestic duties**

<table>
<thead>
<tr>
<th>DOMESTIC DUTIES</th>
<th>NO HELP NEEDED</th>
<th>HOUSE MATE</th>
<th>RELATIVE/FRIEND</th>
<th>SOMEONE ELSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>cleaning</td>
<td>59</td>
<td>9</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>cooking</td>
<td>89</td>
<td>9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>washing</td>
<td>87</td>
<td>8</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>ironing</td>
<td>82</td>
<td>9</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>go to bed/getting up</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>washing/shaving</td>
<td>99</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>dressing</td>
<td>99</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>shopping</td>
<td>91</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>doing odd jobs</td>
<td>72</td>
<td>4</td>
<td>14</td>
<td>10</td>
</tr>
</tbody>
</table>

If you have influenza who will help you with doing your errands? The partner is the first (56% of share) who will offer help, and the children (40%) are a good second. After these come the friends and neighbours (37%), more than relatives do (10%), who often live far away. Only 3% have nobody who will help in this case.

The telephone is the most important instrument (95%) for contact with other people who are important for them, but who live too far away for frequent personal contact.

It is interesting to know if they do some recreational activities or hobbies with other people. 40% had no common activities. About 30% have such activities indoors and 10% has them outdoors.

What types of problems do the elderly met in contacting relatives and friends? We have offered them several possible problems. In table 3 an overview of their reactions is presented.

Table 3 Types of problems people meet in contacting their relatives and friends

<table>
<thead>
<tr>
<th>PROBLEMS</th>
<th>MENTIONED</th>
</tr>
</thead>
<tbody>
<tr>
<td>too far away</td>
<td>40</td>
</tr>
<tr>
<td>too expensive</td>
<td>17</td>
</tr>
<tr>
<td>health situation</td>
<td>24</td>
</tr>
<tr>
<td>nobody to join</td>
<td>2</td>
</tr>
<tr>
<td>stay at home/ care</td>
<td>2</td>
</tr>
<tr>
<td>connections public transport</td>
<td>11</td>
</tr>
<tr>
<td>problems using pt.</td>
<td>7</td>
</tr>
<tr>
<td>no car</td>
<td>13</td>
</tr>
<tr>
<td>no parking facilities</td>
<td>2</td>
</tr>
<tr>
<td>unsafe in darkness</td>
<td>16</td>
</tr>
<tr>
<td>passing unsafe places</td>
<td>3</td>
</tr>
</tbody>
</table>

TOTAL ITEMS MENTIONED: 137


About 50% of the respondents did not mention any problem. Distance is mentioned most frequently as a problem in contacting friends and relatives. Health is a second reason. A relationship between health and distance could exist; this relationship has been mentioned 8 times. The same can be considered for car availability, the expense (10x) and distance.

When asking them to stress the most important problem, distance is mentioned most frequently and health is second. More than 40% of these people with problems stay most of the time at home. The problems are too great to go out.

The elderly are in general happy with the social context. 53% score 7 or higher. The average score is 7.6. But, about 15% have a score of 6 and lower. These people are not so happy with the social situation.

6.5.4 The neighbourhood

Several of the features of this area could explain the satisfaction of people with their residential environment. We have asked people to mention which feature is relevant for their experience of the neighbourhood. We have also asked them to give an opinion on these relevant items (table 4).

Table 4 Relevance of some items for walking in the neighbourhood and the level of hindrance

<table>
<thead>
<tr>
<th>NEIGHBOURHOOD</th>
<th>NOT RELEVANT</th>
<th>LEVEL OF HINDERANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIGH</td>
<td>LOW</td>
</tr>
<tr>
<td>rough footpath</td>
<td>51</td>
<td>16</td>
</tr>
<tr>
<td>obstacles on footpath</td>
<td>75</td>
<td>7</td>
</tr>
<tr>
<td>bad pedestrian crossings</td>
<td>58</td>
<td>15</td>
</tr>
<tr>
<td>too high kerbs</td>
<td>75</td>
<td>5</td>
</tr>
<tr>
<td>lack of space for pedestrians</td>
<td>66</td>
<td>11</td>
</tr>
<tr>
<td>only access via stairs</td>
<td>68</td>
<td>11</td>
</tr>
<tr>
<td>too heavy traffic</td>
<td>60</td>
<td>8</td>
</tr>
<tr>
<td>dangerous crossovers</td>
<td>51</td>
<td>15</td>
</tr>
<tr>
<td>free dogs</td>
<td>51</td>
<td>13</td>
</tr>
<tr>
<td>threatening persons</td>
<td>53</td>
<td>12</td>
</tr>
<tr>
<td>fear for attack or robbery</td>
<td>49</td>
<td>18</td>
</tr>
<tr>
<td>bad traffic lights</td>
<td>67</td>
<td>8</td>
</tr>
<tr>
<td>air pollution or noise</td>
<td>57</td>
<td>13</td>
</tr>
<tr>
<td>unsafe feeling</td>
<td>65</td>
<td>9</td>
</tr>
</tbody>
</table>

The most common nuisances the elderly experience is the fear of an attack or robbery and from threatening persons in the area. People finding these items very inconvenient, show also a low score for satisfaction. 'Free running dogs' is mentioned quite often as relevant, but people can handle it. The same is valid for the heavy traffic. It is relevant, but not a problem.

The correlation between these items and the total satisfaction with the neighbourhood is the strongest with the three items concerning feelings of safety: unsafe feeling, fear of robbery and threatening persons and the ‘free running dogs’. These items are also mutually quite strongly correlated. They are also the most often mentioned as reasons not to go out. Differences between sexes can be found. Males do not have these feelings the most often. For women these feelings are felt most often as being very inconvenient.

The other cluster of related items concerns: dangerous crossovers, heavy traffic and the quality of the footpaths. This last item is not a very relevant feature for a walk in the residential environment. Obstacles on the footpath and too high kerbs are seldom a problem for the elderly. These answers can be explained by the structure of the pedestrian paths in this area. Several neighbourhoods have a footbridge to cross the main road. Some parts of the area have a pedestrian crossing and these create some nuisance.

The general impression is that the physical accessibility of the environment is good. This seems not to be the main reason for a lack of mobility. We asked the people to mention the item that causes the most nuisances. No item is dominant in the negative experience of the elderly. With 8% the free running dogs are most mentioned, but feelings of insecurity have with 7% almost the same weight. 12% of the sample stays at home sometimes because of the problems they experience and 8% solves these by going out with others. Most of these elderly perceive the problems, but these are not strong enough to stay indoors. All items that cause a little bit more stress concern the functioning of the area than its physical condition.

One way to measure the satisfaction of people with the living environment is to ask people what preference they have if they have to move. Table 5 shows the results.

<table>
<thead>
<tr>
<th>ANSWER</th>
<th>FREQUENCY</th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>no preference</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>yes, same area</td>
<td>54</td>
<td>36</td>
</tr>
<tr>
<td>yes, same city</td>
<td>40</td>
<td>27</td>
</tr>
<tr>
<td>yes, near relatives/friends</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>yes, other municipality</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>yes, nice surroundings</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>yes, abroad</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>don’t know</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>TOTAL</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>


63% of the respondents prefer to live in the same area or in the same city. Relatives and friends are no reason to move and the same low share wants to move to more attractive surroundings.

The general impression is that these elderly people are quite happy with the present situation. However, 23% would consider moving and this is a significant share.

To get a better idea of the reasons why people choose as they do, we asked them which are the most important conditions for the residential environment or the location they want to live (table 6)

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>VERY IMPORTANT</th>
<th>LESS IMPORTANT</th>
<th>NOT IMPORTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>quit residential area</td>
<td>72</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>area with much green</td>
<td>85</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>living where the action is</td>
<td>20</td>
<td>28</td>
<td>51</td>
</tr>
<tr>
<td>good public transport</td>
<td>76</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>good and clean environment</td>
<td>95</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>good shopping/services</td>
<td>93</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>good medical care nearby</td>
<td>87</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>near relatives/friends</td>
<td>43</td>
<td>33</td>
<td>23</td>
</tr>
<tr>
<td>a pleasant neighbourhood</td>
<td>92</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>near cultural facilities</td>
<td>26</td>
<td>23</td>
<td>51</td>
</tr>
<tr>
<td>TOTAL N = 150</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


The figures in this table are clear. A good and clean residential area, with a pleasant character and with enough green space is for most elderly people very important. A correlation between all items shows that these three are most correlated. A second cluster concerns the shopping facilities and medical services.
Facilities and services in the residential area

<table>
<thead>
<tr>
<th>ITEM</th>
<th>AVAILABLE</th>
<th>IMPORTANT</th>
<th>DIFFICULT ACCESS</th>
<th>FREQUENCY OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO</td>
<td>SOME</td>
<td>NO ACCESS</td>
<td>DAY</td>
</tr>
<tr>
<td>food store</td>
<td>98</td>
<td>93</td>
<td>89</td>
<td>22</td>
</tr>
<tr>
<td>other shops</td>
<td>98</td>
<td>87</td>
<td>84</td>
<td>9</td>
</tr>
<tr>
<td>pharmacy</td>
<td>98</td>
<td>79</td>
<td>85</td>
<td>-</td>
</tr>
<tr>
<td>hair dresser</td>
<td>91</td>
<td>48</td>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>physiotherapy</td>
<td>93</td>
<td>56</td>
<td>53</td>
<td>1</td>
</tr>
<tr>
<td>doctor</td>
<td>95</td>
<td>82</td>
<td>78</td>
<td>1</td>
</tr>
<tr>
<td>home care</td>
<td>75</td>
<td>38</td>
<td>33</td>
<td>1</td>
</tr>
<tr>
<td>swimming pool</td>
<td>84</td>
<td>22</td>
<td>21</td>
<td>-</td>
</tr>
<tr>
<td>bank</td>
<td>97</td>
<td>61</td>
<td>61</td>
<td>-</td>
</tr>
<tr>
<td>post office</td>
<td>97</td>
<td>87</td>
<td>84</td>
<td>-</td>
</tr>
<tr>
<td>cultural facilities</td>
<td>69</td>
<td>28</td>
<td>23</td>
<td>-</td>
</tr>
<tr>
<td>park or green</td>
<td>98</td>
<td>84</td>
<td>81</td>
<td>21</td>
</tr>
<tr>
<td>bus stop</td>
<td>87</td>
<td>45</td>
<td>39</td>
<td>-</td>
</tr>
<tr>
<td>railway station</td>
<td>93</td>
<td>66</td>
<td>61</td>
<td>-</td>
</tr>
<tr>
<td>church</td>
<td>81</td>
<td>33</td>
<td>31</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 7 Availability and importance of facilities

<table>
<thead>
<tr>
<th></th>
<th>DAY</th>
<th>WEEK</th>
<th>MONTH</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>food store</td>
<td>65</td>
<td>63</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>other shops</td>
<td>46</td>
<td>36</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>pharmacy</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hair dresser</td>
<td>23</td>
<td>51</td>
<td>1</td>
<td>55</td>
</tr>
<tr>
<td>physiotherapy</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>doctor</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>home care</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>swimming pool</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>bank</td>
<td>26</td>
<td>13</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>post office</td>
<td>56</td>
<td>3</td>
<td>24</td>
<td>13</td>
</tr>
<tr>
<td>cultural facilities</td>
<td>4</td>
<td>14</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>park or green</td>
<td>21</td>
<td>6</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>bus stop</td>
<td>7</td>
<td>13</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>railway station</td>
<td>21</td>
<td>18</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>church</td>
<td>3</td>
<td>8</td>
<td>17</td>
<td>8</td>
</tr>
</tbody>
</table>


For the elderly it is less important that the neighbourhood offers entertainment: 'where the action is' or cultural facilities. Green areas are more important for recreation than 'entertainment'. A slightly surprising finding is that living near friends and relatives do not score very high.

After the description of the experience of several features of the residential environment by the elderly we can summarise their feeling in the answer on the question: all in all: how satisfied are you with the area around your house?

This satisfaction is quite high. 40% has a score of 8 and an additional 15% score higher. The mean score is 7.6. These figures affirm the impression we got from the analysis of the different characteristics of the area.

6.5.5 The functional environment

As one of the main characteristics of a functional urban context the available facilities and services are a subject of study. In Table 7 the experience of elderly people with several of these functions has been investigated. These facilities are available if they are accessible within 15 minutes walk. For 90% and more most of the facilities are available. A swimming pool and a church are available for more than 80%. Only the cultural facilities and home care facilities are less available. This is crucial, if these facilities are important for them.

These features, which are less available, are also the same features that are less important for the elderly in this area. The swimming pool is only for 22% important and cultural facilities for 28%. A little bit surprising is also that only 33% of this generation of elderly mention a church as an important feature for the residential area.

The accessibility is hardly a problem for the elderly. If people said that a specific feature was important for them, then we asked them how accessible this was. Some facilities do not give any problem in accessibility, but this concerns maximum 3% of the respondents. The railway stations offer for only 4% any problem in access. If a specific facility was important for them, we have asked them how often they use it. Some people had problems in mentioning this frequency. This explains the difference between the importance and the lower total for 'frequency of use'. The food store and the park are
the most common destinations for the daily trip along with some other shops. Some facilities such as a hairdresser or the church are important for a smaller group, but a large share of this group visits them weekly. For this group of the elderly the visits to a pharmacy and to a doctor are less frequent than expected. 55% visits a doctor only yearly and 15% monthly. A pharmacy is more often the destination of a visit: 46% monthly and 36% only yearly. For public transport these figures show the greater importance of the railway system than the bus. The railway system has a local line with 11 stations within Zoetermeer and this has an important local function.

Only 20 respondents have mentioned any problem in the access to one of the facilities. Most often they mention the health condition (13x) and the long distance (11x) as the most important obstacle. Some services concentrated in the centre of the area are mentioned: shops, railway station, pharmacy, health care centre. The distance to these facilities can be too far for people living in some parts of the area. The public transport is mentioned 6 times: bad connections or difficulties in using the system.

The accessibility of services can be slightly stressful if a service is important for a person, but not available. Only for the accessibility of cultural facilities and for the bus stop was more than one person is in this situation. In total, almost all respondents could be positive about the accessibility or the service is not relevant for them. They are more positive about the satisfaction with services than people who mention any problem.

Especially in solving accessibility problems new technologies could be a solution. No longer would people have to visit the facility. They can use these services from home. We have asked which of the services they would like to use sometimes from home. We realise that most of the elderly did not know all these services and not all of these are available yet. But a positive answer gives an indication of the attitude of these people to new technology (table 8).

Table 8 Share of elderly who want sometimes to use new technology for tele-activities

| %
| banking services | 15 |
| buying goods     | 13 |
| asking for forms | 29 |
| information      | 30 |
| tele-entertainment | 9 |
| medical check-up | 30 |
| monitoring/control of house | 21 |
| education/courses | 7 |


services. Analysis of the number of positive reactions per person shows that there is no concentration. Some persons want to use several of these new technologies. A correlation matrix (table 9) between some relevant variables: age, education, income, wanted new technology and satisfaction with economic situation, total life, mobility and technical equipment, shows a logical structure. The satisfaction with the whole life situation is most strongly interrelated.

Table 9 Pearson correlation matrix included technical equipment and attitude to technology

Table 10 The presence of some features of the dwelling

The satisfaction with the economic situation is again related to the experience of mobility, educational level and income. The whole life satisfaction is also related to the satisfaction with technical equipment.

These findings are summarised in a total score of the satisfaction people have with the services in their residential area. Figure 7 shows that this score is high. 80% has a score of 8 or higher. The average score is 7.9.

Figure 7

Satisfaction with services in residential environment

<table>
<thead>
<tr>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

low 1 2 3 4 5 6 7 8 9 high
Table 9 Pearson correlation matrix included technical equipment and attitude to technology

<table>
<thead>
<tr>
<th></th>
<th>AGE IN CAT'S</th>
<th>EDUCATION IN CAT'S</th>
<th>INCOME ORDINAL</th>
<th>SATISF. ECON. SITUATION</th>
<th>SATISF. TOTAL LIFE</th>
<th>SATISF. MOBILITY</th>
<th>SATISF. TECHN. EQUIPMENT</th>
<th>POSITIVE REACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>age in cat's</td>
<td>1.00</td>
<td>-0.05</td>
<td>-0.22</td>
<td>-0.07</td>
<td>-0.12</td>
<td>-0.35</td>
<td>-0.13</td>
<td>-0.18</td>
</tr>
<tr>
<td>education in cat's</td>
<td>-0.05</td>
<td>1.00</td>
<td>0.01</td>
<td>0.24</td>
<td>0.16</td>
<td>0.22</td>
<td>0.21</td>
<td>0.19</td>
</tr>
<tr>
<td>income ordinal</td>
<td>-0.22</td>
<td>0.01</td>
<td>1.00</td>
<td>0.26</td>
<td>0.08</td>
<td>0.11</td>
<td>0.15</td>
<td>0.05</td>
</tr>
<tr>
<td>satsif. Econ. situation</td>
<td>-0.07</td>
<td>0.24</td>
<td>0.26</td>
<td>1.00</td>
<td>0.51</td>
<td>0.51</td>
<td>0.28</td>
<td>-0.02</td>
</tr>
<tr>
<td>satsif. total life</td>
<td>-0.12</td>
<td>0.16</td>
<td>0.08</td>
<td>0.51</td>
<td>1.00</td>
<td>0.34</td>
<td>0.31</td>
<td>-0.04</td>
</tr>
<tr>
<td>satsif. mobility</td>
<td>-0.35</td>
<td>0.22</td>
<td>0.11</td>
<td>0.51</td>
<td>0.34</td>
<td>1.00</td>
<td>0.29</td>
<td>0.05</td>
</tr>
<tr>
<td>satsif.techn. equipment</td>
<td>-0.13</td>
<td>0.21</td>
<td>0.15</td>
<td>0.28</td>
<td>0.31</td>
<td>0.29</td>
<td>1.00</td>
<td>0.12</td>
</tr>
<tr>
<td>positive reactions</td>
<td>-0.18</td>
<td>0.19</td>
<td>0.05</td>
<td>-0.02</td>
<td>-0.04</td>
<td>0.05</td>
<td>0.12</td>
<td>1.00</td>
</tr>
</tbody>
</table>

In bold: Correlation is significant at the 0.01 level (2-tailed).

Table 10 The presence of some features of the dwelling

<table>
<thead>
<tr>
<th>FEATURES OF THE DWELLING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>extra visitors room</td>
<td>71</td>
</tr>
<tr>
<td>central heating</td>
<td>99</td>
</tr>
<tr>
<td>balcony or terrace</td>
<td>74</td>
</tr>
<tr>
<td>garden</td>
<td>51</td>
</tr>
<tr>
<td>garage</td>
<td>25</td>
</tr>
<tr>
<td>enough parking place</td>
<td>86</td>
</tr>
</tbody>
</table>

Source: URPQ survey in Meerzicht Zoetermeer, 1996.

6.5.6 The dwelling

Almost all the respondents (91%) live independently in a (rented) dwelling. Only 9% live in special housing for the elderly. In table 10 an overview is given of the features of the dwelling.

Central heating is very common in a new residential area. Most get a spare room in the Dutch system of housing assignment. Only for special housing for the elderly this spare room is not available. Of the 136 people in a (rented) house has 78% a spare room, but in a senior accommodation this share is only 1 of 14. In this last type of specific housing nearly everybody has a balcony or terrace. This share is lower in normal housing, while a part of them has a garden. A garage is an exception, but parking places are not a big problem. For all these items can be said that people are more positive in their general experience on the dwelling, if an item is available. Only for the balcony this relation is different: having no balcony means mostly that one has a garden.

Interesting for the quality of life is the question of whether they have any problem with some activities indoors. Table 11 gives an overview of some possible problems.

Table 11 The judgement about some features of the dwelling, if applicable.

<table>
<thead>
<tr>
<th></th>
<th>NOT APPLICABLE</th>
<th>ANNOYING</th>
</tr>
</thead>
<tbody>
<tr>
<td>entrance stairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no lift</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stairs to bedroom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no grips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>wrong position of</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cupboard doors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>not enough privacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>house too small or large</td>
<td></td>
<td></td>
</tr>
<tr>
<td>heating insufficient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>costs of dwelling too high</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: URPQ survey in Meerzicht Zoetermeer, 1996.

The costs of the dwelling are too high. That is mentioned most (58%) as a problem, which is felt by 36% as more or less annoying. Only 25% have some problems with the heating system and 7% has serious problems with it. 15% find his dwelling too large. No relation with the spare rooms has been found. Some persons have any problem with the height of the cupboards. Except for the costs and the heating system the elderly are not complaining about their dwelling.

The relation between these problems and the satisfaction with the dwelling are secondary. Only if people find a problem very inconvenient, the satisfaction score is lower. This correlation is only for the high costs significant (>0.01).

If they had to change the residential situation for health reasons, what alternative would be the first option? Table 12 gives the answer.
### Table 12  Wanted adaptations of residence for health reasons

<table>
<thead>
<tr>
<th>ADAPTATION OF RESIDENCE FOR HEALTH REASONS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>adaptation of own dwelling</td>
<td>35</td>
</tr>
<tr>
<td>move to an adapted apartment</td>
<td>27</td>
</tr>
<tr>
<td>move to a senior apartment</td>
<td>21</td>
</tr>
<tr>
<td>share an apartment with friends</td>
<td>2</td>
</tr>
<tr>
<td>mixed generation in one house</td>
<td>2</td>
</tr>
<tr>
<td>live with children or relatives</td>
<td>1</td>
</tr>
<tr>
<td>nursing or care home</td>
<td>11</td>
</tr>
</tbody>
</table>


The privacy seems to be so important for people that only 5% of these respondents will change to a situation that implies that live with other people in the same house. Not surprising is that the most elderly prefer to adapt their own house. A second choice is to move to an adapted dwelling or to a senior apartment. The difference between these alternatives is not so big. 11% prefers to move to a care or nursing home.

What do we find back in the total satisfaction that they have with their dwelling? 80% is very positive about the dwelling with a score of 8 or higher. The average score of 8.2 is very high.

### Figure 8

<table>
<thead>
<tr>
<th>Satisfaction with the dwelling people of 65+ in Zoetermeer, Meerzicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
</tr>
<tr>
<td>low</td>
</tr>
</tbody>
</table>

### 6.5.7 Leisure activities

Leisure is an important part of the activities of elderly people. In Table 13 we see which types of leisure activities they undertake and if these are important for them. Additionally, we have asked them if they would like to do some of these activities, but they are not at present able to do.

### Table 13 Leisure activities: done and very important or wanted and not able to do

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>DONE</th>
<th>VERY IMPORTANT</th>
<th>% WANTED, BUT NOT ABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>meeting friends in home</td>
<td>85</td>
<td>69</td>
<td>81</td>
</tr>
<tr>
<td>visiting cafe, restaurant or bar</td>
<td>45</td>
<td>25</td>
<td>56</td>
</tr>
<tr>
<td>games (bingo, playing cards)</td>
<td>36</td>
<td>27</td>
<td>75</td>
</tr>
<tr>
<td>get visitors at home</td>
<td>87</td>
<td>75</td>
<td>86</td>
</tr>
<tr>
<td>being pleasant at home</td>
<td>59</td>
<td>40</td>
<td>68</td>
</tr>
<tr>
<td>reading, puzzles, stamps, coins</td>
<td>83</td>
<td>64</td>
<td>77</td>
</tr>
<tr>
<td>short outings (half a day)</td>
<td>66</td>
<td>49</td>
<td>74</td>
</tr>
<tr>
<td>gardening</td>
<td>47</td>
<td>29</td>
<td>62</td>
</tr>
<tr>
<td>do-it-yourself, handicraft, house</td>
<td>47</td>
<td>25</td>
<td>53</td>
</tr>
<tr>
<td>dancing, bowling</td>
<td>15</td>
<td>11</td>
<td>73</td>
</tr>
<tr>
<td>cycle tour</td>
<td>55</td>
<td>43</td>
<td>78</td>
</tr>
<tr>
<td>walking around or in town</td>
<td>78</td>
<td>55</td>
<td>71</td>
</tr>
<tr>
<td>active sport</td>
<td>21</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>watching sport (not TV)</td>
<td>11</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>theatre, concert, movies</td>
<td>41</td>
<td>29</td>
<td>71</td>
</tr>
<tr>
<td>library</td>
<td>44</td>
<td>33</td>
<td>75</td>
</tr>
<tr>
<td>education: courses</td>
<td>11</td>
<td>7</td>
<td>64</td>
</tr>
<tr>
<td>visiting church or religious event</td>
<td>22</td>
<td>16</td>
<td>73</td>
</tr>
<tr>
<td>activities in clubs or groups</td>
<td>34</td>
<td>27</td>
<td>79</td>
</tr>
<tr>
<td>activities for seniors</td>
<td>11</td>
<td>9</td>
<td>82</td>
</tr>
<tr>
<td>fishing</td>
<td>7</td>
<td>7</td>
<td>100</td>
</tr>
<tr>
<td>other</td>
<td>5</td>
<td>5</td>
<td>100</td>
</tr>
</tbody>
</table>


The elderly seem to be most active at home: meeting friends, receiving visitors and reading or other indoor activities. But, they also walk around the area near home or in the town. The large numbers of people active with these activities explain the high figures for its importance. Many of these activities are done in several combinations with other activities. Most people do several activities. 50% does more than 6 activities. Between both age groups (65 - 74 and 75+) there are relevant differences. In all activities the group of 75 and older is less active than the younger group. This difference is smallest for receiving visitors at home (78% and 71%). These differences are largest for the most active items: cycling and walking tours (respectively 61% and 14%, and 65% and 40%).

Indicative of the importance is the relationship between people active with a specific activity and the share of people who mention the same activity as important. It is striking that some activities only have a few people who practise them, but for them these activities are very important. They concern fishing and active sport. Some social activities as visiting friends and host friends belong to the most important activities.
Cycling and active sport are activities which people want to do, but they are not able to. Their physical condition is the most mentioned explanation. This is confirmed by the reasons mentioned by the people for this inability. Most mention the health condition (55% of people with problems).

Other activities with relation with physical condition are mentioned: bowling, dancing or short outings. Visiting the theatre, a concert etc. belongs, perhaps, more to the category of activities, of which everybody wants to do more, but they do not get such a high priority. People mention bad health as the main reason for not going and the high costs as a secondary reason. 78% of this sample mentions no or one activity as ‘wanted but not able to do’.

In a correlation matrix we have brought together several items relevant to leisure behaviour. The main correlation is the same as in the matrix for technology acceptance. These experiences around leisure activities play only a marginal role. The lower the age group the more active people are with important activities and there is a reversed relationship for the higher age group. The satisfaction with mobility is also related to both items. Mobility is an important condition for the ability to be active in leisure time.

How satisfied are the respondents with their leisure activities? They have expressed these in a score on the satisfaction scale. 42% have a score of 8 or more. The average for this scale is 7.1. This score is a little bit lower than most other aspects of life.

### Table 9 Pearson correlation matrix included technical equipment and attitude to technology

<table>
<thead>
<tr>
<th></th>
<th>AGE IN CAT’S</th>
<th>EDUCATION IN CAT’S</th>
<th>INCOME ORDINAL</th>
<th>SATISF. ECON. SITUATION</th>
<th>SATISF. TOTAL LIFE</th>
<th>SATISF. MOBILITY</th>
<th>IMPORT. LEISURE ACT.</th>
<th>PROBLEM LEISURE ACT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>age in cat’s</td>
<td>1.00</td>
<td>-0.05</td>
<td>-0.22</td>
<td>-0.07</td>
<td>-0.12</td>
<td>-0.35</td>
<td>-0.35</td>
<td>0.22</td>
</tr>
<tr>
<td>education in cat’s</td>
<td>-0.05</td>
<td>1.00</td>
<td>0.01</td>
<td>0.24</td>
<td>0.16</td>
<td>0.22</td>
<td>0.08</td>
<td>-0.04</td>
</tr>
<tr>
<td>income ordinal</td>
<td>-0.22</td>
<td>0.01</td>
<td>1.00</td>
<td>0.26</td>
<td>0.08</td>
<td>0.11</td>
<td>0.07</td>
<td>-0.07</td>
</tr>
<tr>
<td>satisf. Econ. situation</td>
<td>-0.07</td>
<td>0.24</td>
<td>0.26</td>
<td>1.00</td>
<td>0.51</td>
<td>0.51</td>
<td>0.09</td>
<td>-0.16</td>
</tr>
<tr>
<td>satisf. total life</td>
<td>-0.12</td>
<td>0.16</td>
<td>0.08</td>
<td>0.51</td>
<td>1.00</td>
<td>0.34</td>
<td>0.06</td>
<td>-0.10</td>
</tr>
<tr>
<td>satisf. mobility</td>
<td>-0.35</td>
<td>0.22</td>
<td>0.11</td>
<td>0.51</td>
<td>0.34</td>
<td>1.00</td>
<td>0.26</td>
<td>-0.30</td>
</tr>
<tr>
<td>important leisure act.</td>
<td>-0.35</td>
<td>0.08</td>
<td>0.07</td>
<td>0.09</td>
<td>0.06</td>
<td>0.26</td>
<td>1.00</td>
<td>-0.19</td>
</tr>
<tr>
<td>problematic leisure act.</td>
<td>0.22</td>
<td>-0.04</td>
<td>-0.07</td>
<td>-0.16</td>
<td>-0.10</td>
<td>-0.30</td>
<td>-0.19</td>
<td>1.00</td>
</tr>
</tbody>
</table>

In bold: Correlation is significant at the 0.01 level (2-tailed).

### Figure 9

Satisfaction with the participation in leisure activities
people of 65+ in Zoetermeer, Meerzicht

6.5.8 Work

Working is only a small part of the activities in this age group. Only 2% does any normal work and 1% sometimes does paid work. With 16% volunteer work is the sole participation in social functioning.

57% of the respondents had a white-collar profession. 26% of them are or were housewives and only 12% were industrial workers (blue collar). This distribution fits into the position of Zoetermeer as new town near to The Hague: the city for the national government. Many clerical workers have made their residence Zoetermeer.

### Table 15 Present or former occupation

<table>
<thead>
<tr>
<th>% OCCUPATION</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>academic or professional</td>
<td>3</td>
</tr>
<tr>
<td>independent profession: industry/service</td>
<td>9</td>
</tr>
<tr>
<td>higher white collar</td>
<td>15</td>
</tr>
<tr>
<td>lower white collar</td>
<td>29</td>
</tr>
<tr>
<td>worker</td>
<td>12</td>
</tr>
<tr>
<td>housewife</td>
<td>26</td>
</tr>
<tr>
<td>unknown</td>
<td>5</td>
</tr>
</tbody>
</table>

6.5.9 Health situation

Their own estimate of physical mobility shows that one third has a problem. They feel their situation as fair or worse. This experience seems to contribute to the feelings they have about the health situation. The worse the mobility is the lower the score for satisfaction with health is: from 8.4 for people with excellent mobility to 4.1 with a poor mobility.

They have more vision problems than hearing problems. This can be distorted in their own observation. More than half of the respondents had problems with vision, but only a small part seriously. 55% say that this has no consequences for their activities, 20% mention some problems. If people have serious problems with vision, more than 70% of them mention that it has consequences for their behaviour. This share is lower than 20% if they have slight vision problems. For hearing problems this is somewhat less constraining. With slight hearing problems, 54% mention consequences for going out or for some activities. With slight problems 22% mention no consequence.

People experience relevant health problems mostly in relation to heavy domestic work like window cleaning. Carrying heavy bags and walking long distances are also relevant. These problems are so serious that these elderly people cannot do these activities. Some problems are mentioned in relation to carrying heavy bags, to climbing stairs, and bending, while heavy housekeeping and walking long distances are less frequently mentioned. Problems with light domestic work would be an indication for problems with living independently. With this condition people are mostly staying in a home with for care or nursing. The last column is an indication that some of these elderly have serious problems with outdoor mobility: going outdoors, shopping, and climbing stairs.

Table 16 The own judgement about the physical mobility condition

<table>
<thead>
<tr>
<th>Physical Mobility in %</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>excellent</td>
<td>25</td>
</tr>
<tr>
<td>good</td>
<td>40</td>
</tr>
<tr>
<td>fair</td>
<td>26</td>
</tr>
<tr>
<td>poor</td>
<td>7</td>
</tr>
<tr>
<td>very poor</td>
<td>1</td>
</tr>
</tbody>
</table>

source: URPG survey in Zoetermeer, Meersicht, 1996.

Table 17 Problems with vision or hearing

<table>
<thead>
<tr>
<th>Health Problems</th>
<th>Vision</th>
<th>Hearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>no problem</td>
<td>42</td>
<td>60</td>
</tr>
<tr>
<td>slightly</td>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>seriously</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>very seriously</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>


Table 18 Health problems with specific activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>No Problem</th>
<th>Any Problem</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>entering dwelling</td>
<td>95</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>bending</td>
<td>77</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>climbing stairs</td>
<td>67</td>
<td>23</td>
<td>9</td>
</tr>
<tr>
<td>going outdoors</td>
<td>94</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>shopping</td>
<td>91</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>dragging heavy bags</td>
<td>47</td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td>drinking</td>
<td>97</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>walking &gt;2 km.</td>
<td>69</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>light housekeeping, dish washing</td>
<td>95</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>heavy housekeeping, windows</td>
<td>57</td>
<td>13</td>
<td>29</td>
</tr>
</tbody>
</table>


We have introduced a new variable concerning the number of activities that people can do in an easy way. In the correlation matrix we see that the personal experience of physical mobility is strongly related with the ease with which people can do several physical activities and satisfaction with the mobility. In this way people have reacted in a consistent way to several aspects of their health situation.

What is their own feeling about the health situation? How satisfied are they with their health? 41% have a score of 8 or higher. The average score is 7.1.

Figure 10

Satisfaction with the health situation

<table>
<thead>
<tr>
<th>%</th>
<th>Satisfaction with the health situation people of 65+ in Zoetermeer, Meersicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Table 19 Pearson correlation matrix including physical mobility

<table>
<thead>
<tr>
<th></th>
<th>AGE IN CAT'S</th>
<th>INCOME ORDINAL</th>
<th>SATISF. MOBILITY</th>
<th>SATISF. HEALTH</th>
<th>EXPERIENCE OF PHYS MOBILITY</th>
<th>EASY ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>age in cat's</td>
<td>1.00</td>
<td>-0.22</td>
<td>-0.35</td>
<td>-0.22</td>
<td>-0.44</td>
<td>-0.43</td>
</tr>
<tr>
<td>income ordinal</td>
<td>-0.22</td>
<td>1.00</td>
<td>0.11</td>
<td>0.06</td>
<td>0.03</td>
<td>0.14</td>
</tr>
<tr>
<td>satisf. mobility</td>
<td>-0.35</td>
<td>0.11</td>
<td>1.00</td>
<td>0.51</td>
<td>0.51</td>
<td>0.54</td>
</tr>
<tr>
<td>satisf. health</td>
<td>-0.22</td>
<td>0.06</td>
<td>0.51</td>
<td>1.00</td>
<td>0.63</td>
<td>0.49</td>
</tr>
<tr>
<td>experience of phys. mobility</td>
<td>-0.44</td>
<td>0.03</td>
<td>0.51</td>
<td>0.63</td>
<td>1.00</td>
<td>0.67</td>
</tr>
<tr>
<td>easy activities</td>
<td>-0.43</td>
<td>0.14</td>
<td>0.54</td>
<td>0.49</td>
<td>0.67</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: Correlation is significant at the 0.01 level (2-tailed).


6.5.10 Mobility behaviour

We distinguished between items related to personal transport and items related to public transport.

**Personal transport**

An important condition for mobility is the use of transport means. Are you using daily or weekly a specific means of transport or did you so previously?

Table 20 shows that the car and the bicycle are the most important individual transport modes for this generation of the elderly. Both are competing in actual use: 32% have used a moped (or a bike) before, but only a few of them are still using one. For the bicycle the situation is different. 34% stopped using the bicycle, but 59% are still using one. The answers to several statements made by the group of people for whom the car or the bicycle was the most important mode are interesting. Some people have mentioned several transport modes. In the next tables we have made a distinction according to car users: the car was the only mode in use or they have indicated that the car was the most important mode for them. The same is done for the cyclists.

Table 20 The actual or former use of personal transport modes

<table>
<thead>
<tr>
<th>USE OF MODE</th>
<th>YES</th>
<th>NO LONGER</th>
<th>NEVER DONE</th>
</tr>
</thead>
<tbody>
<tr>
<td>car</td>
<td>61</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>moped, bike</td>
<td>3</td>
<td>32</td>
<td>42</td>
</tr>
<tr>
<td>bicycle</td>
<td>59</td>
<td>34</td>
<td>5</td>
</tr>
</tbody>
</table>


Table 21 Reactions of car users on some statements about the personal transport mode

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>AGREE</th>
<th>DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to drive or to use a car compared with alternatives the use of a car is the most pleasant</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>I don't like to use a car, but I don't see any alternative</td>
<td>97</td>
<td>3</td>
</tr>
<tr>
<td>Going out in the evening or on special days-off, it is quite impossible to find an alternative for the car</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Total N = 70 Car Users


Table 22 Reactions of cyclists on some statements about the personal transport mode

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>AGREE</th>
<th>DISAGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I like to ride a bicycle compared with alternatives the use of a bicycle is the most pleasant</td>
<td>83</td>
<td>14</td>
</tr>
<tr>
<td>I don't like to use a bicycle, but I don't see any alternative</td>
<td>9</td>
<td>89</td>
</tr>
<tr>
<td>Going out in the evening or on special days-off, it is quite impossible to find an alternative for the bicycle</td>
<td>23</td>
<td>71</td>
</tr>
</tbody>
</table>

Total N = 35 Cyclists


The car is for its users a preferred mode. A small number of them would prefer to use a different mode, but they do not see any alternatives. This is much more valid in the evening or on days off. All in all the car users like to use this vehicle and they do not see many alternatives to its use.

For cyclists this choice is a little bit more differentiated.
They like using the bicycle, but not everybody sees this as a pleasant mode. They have a more positive attitude to the use of a bicycle. Maybe this is stimulated by the comment that the bicycle is good for the environment. In the evening or during days off most people have alternatives for the bicycle.

The general idea is that the elderly find a way to handle the problems they experience with mobility. We have presented several possibilities to our respondents and asked them to give their reaction as car users or as cyclists.

Car users try to avoid bad weather, rush hours and long distances. They have the least problems with complicated junctions, unknown routes or with highways. They try to avoid the rush hour. This fits very well in a policy to spread trips over time. The elderly have the choice of driving outside the rush hour and they also prefer this.

**Table 23 Do you as car user try to avoid some possibilities**

<table>
<thead>
<tr>
<th>POSSIBILITY</th>
<th>YES, FOR SURE</th>
<th>YES, IF POSSIBLE</th>
<th>NO, IDEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>bad weather</td>
<td>14</td>
<td>30</td>
<td>51</td>
</tr>
<tr>
<td>driving at dusk or at night</td>
<td>11</td>
<td>27</td>
<td>57</td>
</tr>
<tr>
<td>driving with bad road conditions</td>
<td>7</td>
<td>27</td>
<td>61</td>
</tr>
<tr>
<td>complicated junctions</td>
<td>1</td>
<td>13</td>
<td>81</td>
</tr>
<tr>
<td>driving at rush hour</td>
<td>14</td>
<td>40</td>
<td>41</td>
</tr>
<tr>
<td>busy roads</td>
<td>6</td>
<td>37</td>
<td>53</td>
</tr>
<tr>
<td>driving long distances</td>
<td>13</td>
<td>19</td>
<td>64</td>
</tr>
<tr>
<td>driving unknown routes or areas</td>
<td>6</td>
<td>16</td>
<td>74</td>
</tr>
<tr>
<td>driving motorways</td>
<td>6</td>
<td>11</td>
<td>77</td>
</tr>
</tbody>
</table>


**Table 24 Do you as cyclist try to avoid some possibilities**

<table>
<thead>
<tr>
<th>POSSIBILITY</th>
<th>YES, FOR SURE</th>
<th>YES, IF POSSIBLE</th>
<th>NO, IDEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>bad weather</td>
<td>23</td>
<td>54</td>
<td>23</td>
</tr>
<tr>
<td>driving at dusk or at night</td>
<td>51</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>driving with bad road conditions</td>
<td>17</td>
<td>49</td>
<td>34</td>
</tr>
<tr>
<td>complicated junctions</td>
<td>6</td>
<td>20</td>
<td>74</td>
</tr>
<tr>
<td>driving at rush hour</td>
<td>14</td>
<td>23</td>
<td>63</td>
</tr>
<tr>
<td>busy roads</td>
<td>14</td>
<td>20</td>
<td>66</td>
</tr>
<tr>
<td>driving long distances</td>
<td>34</td>
<td>23</td>
<td>43</td>
</tr>
<tr>
<td>driving unknown routes or areas</td>
<td>14</td>
<td>23</td>
<td>63</td>
</tr>
</tbody>
</table>


As a measure of how serious is this, how many of these persons agreed with some statements.

Car users miss much more the freedom that their car offers. They miss the car, but they have found other solutions and they affirm quite often that all they need is in the vicinity. The last reason is more often mentioned by the cyclists.
Table 26 Did you miss your car or bicycle after you stopped using it?

<table>
<thead>
<tr>
<th></th>
<th>% AGREE</th>
<th>% AGREE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I miss the freedom to travel as I want to do it</td>
<td>70</td>
<td>27</td>
</tr>
<tr>
<td>I am often too much home bound, I can not leave now and then I miss my car, but I have a solution for the most important activities</td>
<td>35</td>
<td>8</td>
</tr>
<tr>
<td>no problem, I have found a good alternative all I need is in this neighbourhood</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>Total N2026</td>
<td>65</td>
<td>85</td>
</tr>
</tbody>
</table>


In this way they rationalise why they have stopped cycling, and if they miss the bicycle they have found a solution. They have often found an alternative. This alternative can be someone else’s car or a paid alternative (taxi).

Table 27 suggests that someone else in the social environment is prepared to drive. The paid alternative is less popular, only used if it is urgent.

Table 27 Do you have someone else who brings you, where you want, paid or not?

<table>
<thead>
<tr>
<th>ALTERNATIVE CAR</th>
<th>NO ALWAYS IF Needed IF Urgent DON’T KNOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>partner, friend, relative or volunteer</td>
<td>13   28   33   9   17</td>
</tr>
<tr>
<td>paid</td>
<td>36   3    6    14   41</td>
</tr>
</tbody>
</table>


Going by foot can often be an alternative for the car or the bicycle, especially in a situation where most facilities are in the vicinity, as we have seen. Can elderly people go always by foot if they want, or do they avoid specific situations?

Table 28 Do you avoid specific situations as pedestrian?

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>YES, ABSOLUTELY</th>
<th>YES, IF POSSIBLE</th>
<th>NO, NO EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>crossing road at dusk or during night</td>
<td>39</td>
<td>21</td>
<td>35</td>
</tr>
<tr>
<td>slippery road</td>
<td>48</td>
<td>39</td>
<td>9</td>
</tr>
<tr>
<td>walking in city at rush hour</td>
<td>13</td>
<td>17</td>
<td>67</td>
</tr>
<tr>
<td>cross road without pedestrian crossing</td>
<td>8</td>
<td>34</td>
<td>55</td>
</tr>
<tr>
<td>walking along busy road without sidewalk</td>
<td>27</td>
<td>50</td>
<td>19</td>
</tr>
<tr>
<td>going to unfamiliar places</td>
<td>11</td>
<td>18</td>
<td>67</td>
</tr>
<tr>
<td>busy traffic</td>
<td>9</td>
<td>22</td>
<td>65</td>
</tr>
</tbody>
</table>


Slippery roads are the most threatening for the elderly. About half of the respondents will avoid walking on slippery roads. Crossing a road when it is dark or walking along a busy road is also avoided. If possible they will look for an alternative to cross a road without a pedestrian crossing.

The total satisfaction with mobility is good. 65% have a score of 8 or higher and the average score is 7.7. The findings show that these elderly people have some problems, but these figures also make it clear that most of them have found solutions to get where they want to go. So far, public transport is not mentioned as an alternative. This explains why people stopped using their own transport mode.

Figure 11

<table>
<thead>
<tr>
<th>Satisfaction with the mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>people of 65+ in Zoetermeer, Meerzicht</td>
</tr>
<tr>
<td>%</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>10</td>
</tr>
</tbody>
</table>

Public transport

Not all respondents use public transport. 20% say that they can not comment about this transport mode.

Table 29 Frequency of public transport use and differentiation in time or season

<table>
<thead>
<tr>
<th>VEHICLE</th>
<th>FREQUENCY (IN %)</th>
<th>TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MOSTLY NOW AND</td>
<td>NEVER</td>
</tr>
<tr>
<td></td>
<td>THEN</td>
<td></td>
</tr>
<tr>
<td>bus</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td>tram</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>train</td>
<td>27</td>
<td>43</td>
</tr>
<tr>
<td>air plane</td>
<td>1</td>
<td>38</td>
</tr>
<tr>
<td>taxi</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>special transp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>elderly</td>
<td>8</td>
<td>11</td>
</tr>
</tbody>
</table>

We have asked them how often they use the public transport and if it made any difference in daytime or evening and also if the season of the year makes any difference.

These elderly people are not frequent public transport users. Only the train is used with a high frequency. This can be explained by the high density of this local system in Zoetermeer (11 railway station). The special systems as an 'elderly-bus' and 'OV-tax' (taxi) are not used frequently. Except for the train, more than 60% of these respondents never use public transport.

The differentiation in time is minimal. They do not make any difference between day or night or season, but a part of the explanation for this can be found in the low frequency of all usage. The people using public transport 'sometimes' or 'often' have been asked about the reasons they have for this usage. Bus and train are the most relevant modes in Zoetermeer.

— 58 persons use the bus and 60% of them agree that the stops are well located and easy to access; 45% say the bus meets my needs; 45% have no alternatives; 36% say no need to look for a parking place and 24% say the bus is not expensive.

— 104 persons use the train. 43% agree that the stops are well located and easy to access. The difference with the bus is clear. The train is less flexible and the distance to the station can be quite a long way in some parts of the area. The same tendency to a lower appreciation can be seen in the 35% of this group that agree with the statement that 'the train meets my needs' or that 'there are no alternatives'. 45% say 'no need to look for a parking place'. Indeed, near each station many parking places are available. 24% say the train is inexpensive.

For the people who do not use public transport we have asked them why. For bus (90 non-users) and train (43 non-users) most agreed with the statements: no need (respectively 46% and 58%) and many fewer with the statement that the bus or train is too expensive (respectively 13% and 12%).

The general satisfaction with public transport is lower than the other judgements. 48% has a score of 8 or higher and the average score is 7.0. This is the lowest score. In this score the people who said that they did not have a judgement about the system are left out. This will be a group of not users for a large part.

Figure 12

<table>
<thead>
<tr>
<th>Satisfaction with the public transport</th>
<th>%</th>
<th>people of 65+ in Zoetermeer, Meerzicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>medium</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>high</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>maximum</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>maximum</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

6.5.11 Problems with accessibility

In the next table we have summarised the problems people have with meeting friends and relatives, with visiting several facilities in the neighbourhood, and with leisure facilities. The total number concerns all those people who have mentioned at least one difficulty in that aspect. The percentages in the columns are related to the total number of people who have mentioned any problem with these activities.

<table>
<thead>
<tr>
<th>Table 30 Difficulties in reaching ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>in columns the percentage of people with difficulties who mentioned this item</td>
</tr>
<tr>
<td>RELATIVES/ FRIENDS</td>
</tr>
<tr>
<td>PERSONS WITH DIFFICULTIES</td>
</tr>
<tr>
<td>% OF TOTAL SAMPLE N=150</td>
</tr>
<tr>
<td>Health reasons</td>
</tr>
<tr>
<td>Too far away</td>
</tr>
<tr>
<td>Bad public transport connections</td>
</tr>
<tr>
<td>No opportunities available</td>
</tr>
<tr>
<td>Not enough time</td>
</tr>
<tr>
<td>Difficulties in using public transport</td>
</tr>
<tr>
<td>Has no one to go with</td>
</tr>
<tr>
<td>Too expensive</td>
</tr>
<tr>
<td>Is afraid of going out when it is dark</td>
</tr>
<tr>
<td>Care for a family member</td>
</tr>
<tr>
<td>Too hectic streets</td>
</tr>
<tr>
<td>No car</td>
</tr>
<tr>
<td>No parking possible</td>
</tr>
<tr>
<td>Bad road conditions</td>
</tr>
<tr>
<td>Feels too old</td>
</tr>
</tbody>
</table>

For contacts with friends and relatives distance is the most relevant problem. Health is a second reason. 11 persons of the 24 who mention health do this in combination with distance. The problems with physical mobility explain partly the negative experience of distance. The high travel costs are mentioned 10 times together with the distance.

The feeling of safety in the dark is another important problem that the elderly experience in visiting friends and relatives. The quality of public transport connections is not related to the distance problems, or this group of elderly does not see the public transport as an alternative.

For visiting facilities people have been asked what types of difficulties they experience if some important facilities are hard to reach. Health is the most frequently mentioned as problem, 4 times combined with the distance. Some of the elderly mention distance as a second problem. For this aspect we have to realised that only a small number have problems, most elderly people in Zoetermeer have no problems with the accessibility of facilities.

For leisure, again health is the most frequently mentioned problem. For this aspect the company of other people also plays a role. It is striking that health problems are more often mentioned in connection with facilities and leisure activities. Is there any relation here with the level of discretion? For friends and relatives you have no choice: you have to make the contact by yourself. For facilities and leisure activities alternatives are available (other people can visit shops etc.) or one can decide not to participate without a strong impact on the quality of life. This opens up the possibility to find an argument for non-participation. The distance for the leisure activities is related to the distance to friends and relatives and this explains the low score for this item.

### 6.5.12 The usage of equipment

One of the goals of this research project is to find alternatives for the problems the elderly experience. Technology could be one of these alternatives. Against this background it is relevant to know what is the attitude of elderly towards new equipment. For several types of equipment we have asked them, if they have this equipment, if they are familiar with the possibilities and how user-friendly this equipment is.

Teletext is the most common device that this generation has. The availability of a video recorder and of the microwave is surprisingly high. Their own heating system is more rare. In apartment buildings the central heating is a general system. Teletext seems to have the most difficulties for people. If they have a specific device, then they know the most important possibilities and a large number have the idea that they know all the possibilities. More surprising is the finding that most of the respondents say that they find the equipment simple to use. This total image does not indicate the elderly as a group of electronic illiterates. If they have specific equipment, then many can handle it quite well. This may make us optimistic about the capacity to handle new equipment too.

We have introduced a new variable for the number of types of technical equipment people own. Another new variable concerns the attitude of people to new technology. This variable is composed of people with a positive attitude, which consists of owning the equipment, knowing at least the most important
Table 32 Pearson correlation matrix including variables concerning technical equipment

<table>
<thead>
<tr>
<th></th>
<th>AGE IN CAT’S</th>
<th>INCOME ORDINAL</th>
<th>SATISF. ECON. SITUATION</th>
<th>SATISF. TECHN. EQUIPMENT</th>
<th>POSSESSION OF TECHN.</th>
<th>ATTITUDE TO NEWTECH</th>
</tr>
</thead>
<tbody>
<tr>
<td>age in cat’s</td>
<td>1.00</td>
<td>-0.22</td>
<td>-0.07</td>
<td>-0.13</td>
<td>-0.21</td>
<td>-0.20</td>
</tr>
<tr>
<td>income ordinal</td>
<td>-0.22</td>
<td>1.00</td>
<td>0.26</td>
<td>0.15</td>
<td>0.18</td>
<td>0.16</td>
</tr>
<tr>
<td>satisf. economic situation</td>
<td>-0.07</td>
<td>0.26</td>
<td>1.00</td>
<td>0.28</td>
<td>0.10</td>
<td>0.14</td>
</tr>
<tr>
<td>satisf. technical equipment</td>
<td>-0.13</td>
<td>0.15</td>
<td>0.28</td>
<td>1.00</td>
<td>0.32</td>
<td>0.29</td>
</tr>
<tr>
<td>possession of techn</td>
<td>-0.21</td>
<td>0.18</td>
<td>0.10</td>
<td>0.32</td>
<td>1.00</td>
<td>0.80</td>
</tr>
<tr>
<td>attitude against newtech</td>
<td>-0.20</td>
<td>0.16</td>
<td>0.14</td>
<td>0.29</td>
<td>0.80</td>
<td>1.00</td>
</tr>
</tbody>
</table>

In bold: CORRELATION IS SIGNIFICANT AT THE 0.01 LEVEL (2-TAILED).

possibilities and experiencing its use as easy. We have made a correlation matrix of this variable together with some of the other relevant characteristics.

Not surprising is the high correlation between the attitude to new technology and the ownership of technical equipment. This ownership is again related to satisfaction with technical equipment and this, in turn, with the economical situation, the income and the comparatively younger age group.

10% of this sample have a computer and an additional 5% use it sometimes. 62% have no computer or have no idea how it works.

The telephone can be used to order fresh goods (food, bread, milk, meat etc.) from a distance, a way of tele-shopping. This way of shopping is not popular. Only 6% do it sometimes. Most of them ask other people to do some shopping (24%) or they wait till they can do it personally (69%).

Some TV-programs offer the possibility of buying products. 71% never do, but 23% do it sometimes.

The use of a check card with PIN or credit card is much more common in the society. How do elderly people handle these?

The PIN card from a bank is a generally accepted way of paying, even for the elderly. 11% have no bankcard. The credit card is less common. 80% does not feel the need for such a card or does not have it.

Today it is more common for different institutions to use automatic equipment to handle specific tasks: speaking computers, ticket machines, etc. How do elderly people handle this equipment and do they have any choice?

Most elderly people do not use automatic devices for specific activities. The Automatic Teller is the most accepted. A second is the telephone card. Both do not give too many problems. Only the automatic teller seems to be so accepted that people say that they use it voluntarily. Even the telephone card is used more because of the lack of alternatives.

Table 33 Feeling about using the check card with PIN or the credit card

<table>
<thead>
<tr>
<th>FEELINGS ABOUT USAGE</th>
<th>PIN CARD</th>
<th>CREDIT CARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes, it is normal for me</td>
<td>65</td>
<td>11</td>
</tr>
<tr>
<td>yes, if no alternative</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>yes, hard to memorise PIN</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>no, using is risky</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>no, afraid to loose</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>no, don’t need</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>no, I don’t have it</td>
<td>11</td>
<td>53</td>
</tr>
</tbody>
</table>


We have summarised the experience of people with these automatons. About one third of the elderly has any problem with these automatons. One quarter finds that at least one automate is easy to use and an additional 20% at least two automate.

A quarter of the respondents find it difficult to use technological equipment or do not like it. The rest can handle it with a manual or after demonstration. The overall satisfaction with the use of technological equipment is a little bit lower. 47% has a score of 8 or higher. The average score is 7.2.
Table 34 The use of automatic devices and the choice people experience

<table>
<thead>
<tr>
<th>AUTOMATIC DEVICE</th>
<th>EXPERIENCE IN USING</th>
<th>FREE CHOICE % of Users</th>
<th>NO-CHOICE % of Users</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DON'T USE IT</td>
<td>TOO COMPLICATED</td>
<td>NEVER SURE TO DO IT RIGHT</td>
</tr>
<tr>
<td>ticket machine</td>
<td>65</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>cash dispenser</td>
<td>45</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>card telephone</td>
<td>53</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>automatic entrance</td>
<td>79</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>phone service</td>
<td>73</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: UPRC survey in Zoetermeer, 1996.

Table 35 the reaction of people which statement fits the best to their usage of automatic devices.

<table>
<thead>
<tr>
<th>STATEMENT</th>
<th>FITS BEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>no problems in understanding the functioning of device</td>
<td>20</td>
</tr>
<tr>
<td>with a manual I have no problems in understanding</td>
<td>29</td>
</tr>
<tr>
<td>after demonstration I have no problems</td>
<td>24</td>
</tr>
<tr>
<td>I find it difficult to use technological equipment</td>
<td>17</td>
</tr>
<tr>
<td>I don't like to use technological equipment</td>
<td>9</td>
</tr>
</tbody>
</table>

Source: UPRC survey in Zoetermeer, 1996.

Figure 13 Satisfactory with the use of technical equipment

<table>
<thead>
<tr>
<th>%</th>
<th>people of 65+ in Zoetermeer, Meerzicht</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

6.6 Satisfaction with the local situation

We have asked how satisfied the elderly are with the local situation. This satisfaction has been distinguished in several sub-items. The most general question concerns the satisfaction with the whole life situation. The average score of their answers is 8.2. This is the highest score of all the satisfaction questions. In the sample 80% score 8 or higher. Are people so satisfied with the whole situation? We know that the elderly are inclined to accept their situation. The analysis of the satisfaction with several aspects of their life will give a better indication of their real feelings, and the feelings about these aspects can be supported by the reactions on many details in their living situation.

According to the theoretical frame we defined the quality of life as the quality of the relationship between the individual and the context: the person-environment system. Within this person-environment system we have distinguished four different subsystems:

- the person and his psychological environment;
- the functional environment;
- the physical environment;
- the social environment.

In the questionnaire we have asked people to evaluate their satisfaction with several aspects of the person-environment system.

- The personal situation concerns: health and financial situation.
- The functional environment concerns: local facilities, recreation, work.
- The physical environment concerns: dwelling and residential environment.
- The social environment concerns: social relationships.
- Personal mobility, public transport and the handling of equipment are important mediating factors between individuals and their context.

An important part of the residential environment concerns the dwelling. This is evaluated very positively with a score of 8.2. Most of the aspects of life get a positive judgement. Public transport gets the lowest score with 6.7, leisure and work have a score of 7.1 and the satisfaction with modern equipment gets a score of 7.3, the same as the health situation. The last score is a
little bit surprising. A stronger parallel between the judgement about the whole life situation and the health would have been expected.

The satisfaction with the whole life situation is very high. 79% of these elderly people give a score of 8 or more. The average score is with 8.2 as high as the satisfaction with the dwelling. These satisfaction scores, especially the most general scores, give an indication that these elderly people are quite satisfied with their situation. Is this typical for this group of people, or is the situation, in comparison with other situations, quite good? A more detailed analysis of several aspects of life in Meerzicht will clarify these questions. People are more direct in their judgements about details in the situation. Also, we have to realise that we have asked people if they are satisfied with several aspects. Satisfaction means that people have to weigh their judgement against alternatives. In this situation people have a natural need to reduce the dissonance between experience of the actual situation and what they feel. If they have no alternatives they will try to create a positive total judgement. In the next part we will go into more detail.

Figure 14

Satisfaction with the whole life situation
people of 65+ in Zoetermeer, Meerzicht

%  
60  
50  
40  
30  
20  
10  
0  
low 1 2 3 4 5 6 7 8 9 high

6.6.1 Interrelationships between the several aspects of the satisfaction
In a correlation matrix (table 36) all the relationships between the different aspects of residential life are described. The strongest relationships exist between personal mobility and physical health and with satisfaction with public transport and the dwelling. Health is clearly a condition for mobility. The strong relationships between satisfaction with public transport and mobility are not surprising. The satisfaction with the dwelling may be related to the good accessibility and the good conditions the dwelling offers for mobility. The relationships between the way people use their urban environment and their satisfaction with public transport and personal mobility is very understandable: mobility is a necessary condition to use the environment. A strong relationship exists also between health and the satisfaction with the total life situation.

The satisfaction with life as a whole is related to health, the financial situation, public transport, social contacts and the residential environment. Any interaction between variables such as health, mobility and public transport is part of the explanation.

6.6.2 Relationships between the type of building and satisfaction
A distinction has been made between three areas.

— ‘Bossen’-district (the names of the streets end with ‘bos’). This is the oldest part of the area. The original plan of this estate consisted of all high rise buildings. During the process of realisation the ideas about new residential estates has been changed radically. People preferred mostly low-rise buildings in rows (terrace) houses or detached houses. This part was realised or was in the process of being realised and this part consists of high building blocks (37 respondents).

— ‘Waarden’-district. This is the central part of the estate, built around a large shopping mall and some central facilities: health care centre, community centre and church, library, social service and a railway station. In this part is also a service apartment building for the elderly: living independently, but with extra service. Another part of the housing is designated for small households. The building blocks are less huge than the other area (27 respondents).

— ‘Water, Land en Bergen’-district. This part consists mainly of low-rise building. A few blocks of four floors were built in this area. Part of these low-rise houses is subsidised housing, but a large part belongs to the private sector (86 respondents).

This description is needed to understand the differences in the satisfaction of people. This judgement is not only based on the feelings people have, but also on the actual situation in the vicinity.
The dwellings are different in these areas, but the standards are high so that all dwellings built during the last three decades are good. This quality is true for most households. On the other hand, public transport is very different in parts of this estate. The best quality is in the central part with the railway station and bus stops very near. A part of the Bossen is near to the bus routes. The worst part is the low-rise area. This area is located far from the railway station. An extra bus route runs through a part of the area to reduce the distance, but the frequency is low. The central location with all the facilities also explains the high satisfaction with the functional environment in the central area. All the important facilities are very close.

For the financial situation it could be relevant that the high-rise buildings have been mostly built as subsidised housing and this means that people with lower incomes live there. The low-rise area is near to the park and the density is quite low with much greenery. People of that area feel this as a good quality.

The lower judgement in the central part can be partly explained by the elderly people living in the service apartment building. An indication, therefore, is that they have some problem with ADLs. Against this background a lower evaluation of new equipment, personal mobility and especially the health situation can be explained.

All in all, the differences in satisfaction with most aspects can be understood from the quality of the actual situation.

<table>
<thead>
<tr>
<th>% SATISFACTION</th>
<th>HIGH RISE</th>
<th>CENTRAL</th>
<th>LOW RISE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCORE OF 8 OR MORE</td>
<td>81 81 81</td>
<td>61 59 70</td>
<td>70 84 84</td>
<td>82 79 79</td>
</tr>
<tr>
<td>dwelling</td>
<td>81</td>
<td>61</td>
<td>70</td>
<td>84</td>
</tr>
<tr>
<td>residential environment</td>
<td>72</td>
<td>59</td>
<td>74</td>
<td>70</td>
</tr>
<tr>
<td>social contacts</td>
<td>77</td>
<td>44</td>
<td>76</td>
<td>51</td>
</tr>
<tr>
<td>functional environment</td>
<td>79</td>
<td>85</td>
<td>84</td>
<td>65</td>
</tr>
<tr>
<td>leisure and work</td>
<td>71</td>
<td>48</td>
<td>73</td>
<td>41</td>
</tr>
<tr>
<td>personal mobility</td>
<td>75</td>
<td>52</td>
<td>74</td>
<td>70</td>
</tr>
<tr>
<td>public transport</td>
<td>71</td>
<td>61</td>
<td>77</td>
<td>38</td>
</tr>
<tr>
<td>modern equipment</td>
<td>73</td>
<td>26</td>
<td>69</td>
<td>51</td>
</tr>
<tr>
<td>health situation</td>
<td>73</td>
<td>26</td>
<td>65</td>
<td>43</td>
</tr>
<tr>
<td>financial position</td>
<td>72</td>
<td>59</td>
<td>77</td>
<td>53</td>
</tr>
<tr>
<td>life situation as a whole</td>
<td>81</td>
<td>70</td>
<td>82</td>
<td>80</td>
</tr>
<tr>
<td>TOTAL N</td>
<td>37 27 86</td>
<td>150</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table 37 Satisfaction with several aspect of living in Meerzicht Zoetermeer.
Notes
1. Colleagues at the Regional and Spatial Planning Group have greatly contributed to the different phases of the survey. Dick den Adel helped with the organisation, Mart Tacken has performed most analyses, and Herman van Veldhuizen handled the gathered data.
2. Very helpful comments came from Annalisa Morini, ICITE CNR Rome, Italy, and from Maria Vittoria Giuliani, Institute of Psychology, CNR Rome, Italy.
3. Here ‘need’ is understood as any motivation that leads to an action. Therefore, both forced needs, as overcoming problems, and desired needs, like realising opportunities, are included.
4. See chapter 1.
7. Design Programme for Meerzicht
7.1 Changing conditions

The design of modern socio-spatial settings makes much use of the zoning principle, and seeks for physical closeness between people and services. Urban areas are given specific and exclusive functions in the organisation of the whole urban area, which is hierarchically organised in relation to the city centre. The availability of fast transportation systems allowed the extension of the concept of physical vicinity over longer distances. This system was concerned with the overcoming of time with space.

Advances in information and communication technologies bring elements of further complexity into this over-simplified conception. As working, education, recreation, shopping, health care and many other activities can be performed in almost any place, only dependant upon the choices of the users and the availability of equipment, it makes no sense any longer to think in terms of fixed spatial developments, and this applies especially to residential areas. Established distinctions amongst living, working, recreation, and production, between what is private and what is public, what is personal and what is collective, are increasingly loosing significance in the compressed time-space environment of telematics-supported societies. The same traditional distinction between territorial scales is challenged by the inter-connection possibilities supplied by telematics networks: the distinction between local and global and between the individual and the collective assumes new forms and meanings. As every single point of networks is an integral part of a system that potentially spans the whole globe to reach the most remote regions, the local context merges into a global environment of information exchanges, transactions and sociality wherein individuals, groups, and societies find new ways to operate and to relate with each other.

The crisis in the meaning of traditional elements and categories of composition in urban design does not simply refer to the internal structures of single elements, but encompasses the changing relationships between these elements. As we have seen in Chapter 2, the functional and social components of urban settings can be re-organised by the introduction of telematics applications in a process that is leading towards a variety of possible alternative configurations. The choice of the right solution for a specific problem of urban design is no longer confined to the traditional repertory inherited from the modern time. Designers have more freedom in the combination of elements. In Chapter 4 we also observed the combined effect of this re-organisation at different scales, pointing out that it is increasingly difficult to distinguish urban areas according to their main supposed function. Each point in the net can contain any other point and can be the place for rather any activity, both of functional and social nature.

It does not make sense any longer to try to design architectures and cities by segregating activities in space. A new approach to the design of urban settings should recognise the complexity of the new situation and its constructive value. For any situation a variety of possibilities is available which designers and users can combine in different ways. The city per parts of the modern times makes room for the post-modern network city where multiplicity, variety, diversity, flexibility should be accommodated within a design that seeks for new values and relationships between the elements of the composition. Architects and designers are confronted nowadays with the task of designing this complexity and no longer have to deal with complicated structures. An important consequence here is that we should give up the pretentious modern attitude towards the full and complete understanding of all relationships within a system, focusing instead upon the whole as a holistic product of a complex system.

The old zoning principle is no longer able to supply answers to the growing complexity of urban environments. Physical vicinity can be integrated and sometimes substituted by virtual accessibility. Thinking in terms of networks is more suitable to describe and design this complexity. The city of the future is the Network City where applications of telematics support a growing range of possible inter-relations for a variety of goals of a functional and social nature. The Network City requires the development of new strategies and concepts to inform the design of future socio-spatial settings.

7.2 A new design brief

The task of approaching new concepts of urban planning and design is above all a matter of formulating
a new design brief (Drewe, 1998b). This should be a new
design programme in which the relevance of the
different possibilities of re-organisation enabled by
telematics applications in relation to a specific set of
design problems is set out. It is a matter of identifying
location-specific case studies where the development of
alternative design projects can take place. The
experience currently underway in the Design Studio ‘The
Network City’ can serve as an example.

However, since it is not always clear what designers
mean when they talk of programmes, it would be
convenient to specify our interpretation. Indeed, the use
of the term programme is not self-evident in its meaning
as it may refer to different situations (Shirvani, 1985).
Sometimes with a design programme designers refer to
an implementation process or even to the whole design
process itself. At other times programmes describe a
process of maintenance of the qualities of a certain
existing urban area or of an environment that will be
created, a process that also needs to be planned.
Building programmes are yet another item. They are
often concerned with the definitions of quantities in
terms of covered surfaces and volumes, and of the
physical relationships between the parts of the urban
design. Finally, a design programme can also be
understood as the formulation of qualitative design
guidelines for a specific situation.

This last interpretation is closer to what we intend by the
term design programme. For us a design programme
refers to the complex of initiatives and indications that
guide the design of an intervention in a specific
situation. This intervention is required to reach a whole
set of objectives originated by drives and problems of
different natures. Programmes must be flexible enough
to permit different design interpretation in order to
choose from more options the most convenient one;
and strict enough to reach the goals. This means
operating a confrontation between instruments and
goals leaving the door open for different paths to reach
the pre-determined aims.

Taking into consideration the network city model we
discussed in Chapter 1, we can understand a design
programme as the relationship between the first and the
second level of the model. The programme defines the
requirements for the realisation or adaptation of the
physical environment (first level) in relation to a certain
set of objectives, while in turn the physical environment
conditions the range of possibilities regarding its
availability for functional or social uses (second level).

7.3 Elements for a programme for Meerzicht

What could be a programme for the design of an
intervention in Meerzicht? The survey we conducted in
this area provided us with information on the actual
situation of a sample of elderly people. In the previous
Chapters we have already analysed the possibility range
of telematics applications in the context of functional
and social re-organisation in cities, and we highlighted
some design issues concerning tele-activities and their
combined effects at different design scales. Chapter 5
made the point on the main characteristics of an ageing
society and the potential of telematics for the
improvement of the quality of life of older individuals. All
this information is important for the formulation of a
new design brief for the Meerzicht area.

The survey and the observation of physical trace (Zeisel,
1981) allowed us to recognise a number of items into
which improvements can be brought. We distinguished
three areas in the neighbourhood: the high rise, low rise,
and central areas.

Many problems arise in the central area, the most
congested of the neighbourhoods due to the presence of
the shopping centre and the railway station.

Respondents find this zone quite unattractive: the only

Figure 1 A view of the shopping centre in the central area of
Meerzicht.
positive scores relate to the functional environment and public transportation, while all other dimensions are below average. The unfriendly design of the area certainly contributes to this situation. Orientation in the shopping centre is not easy: the covered corridors impede the perception of the outside and hardly allow direct light to penetrate. A large part of the area is occupied by parking places serving the shopping centre and the station. The same station gives the impression of a potentially dangerous place, where little social control can be exercised. This also applies to the shopping centre. The residential buildings in the zone, both low-rise and high-rise, have unclear relationships with each other and with the other components of the physical context.

All in all, the high-rise zone seems to be appreciated by its inhabitants more than the inhabitants of the other zones. The dwellings are good. The large courts in front of the buildings make possible some social contacts (they have been cleared of garages and re-designed as places of circulation and exchange). The functional environment is acceptable (not far from shops and station where there are no relevant hindrances impeding access) even if improvements are possible and would be welcomed. Instead, the experience with the physical structure of the zone is less positive: the re-design of the large courts also aims to make the environment pleasanter by making each court different from the others and thus more recognisable.

Problems are experienced with social contacts (probably because of the lack of a clear meeting place) and with the functional environment, including public transport. The position of the main neighbourhood road for car traffic (4 lanes) certainly plays an important role concerning this last point. It must be crossed to get to the shopping centre and this has relevance to the perception of the distance. The overhead bridges for pedestrians seem not to be efficacious.

Figure 2 A recently renewed courtyard in the high-rise area.

The low-rise zone has the best dwellings and the best physical structure of the whole neighbourhood.

Figure 3 The low-rise area.

A particular concern is regarding the social contacts in the neighbourhood, which seem to be unsatisfactory. The general low score for leisure activities confirms this. Apart from the large courts in the high-rise area, the other zones have a structure that hardly allows fostering social contacts. We have the impression that the elderly of the area will experience problems of social isolation as their capacity of mobility declines. The sample

Figure 4 A bridge for pedestrians over the Meerzichtlaan.
reported that a major hindrance for meeting relatives and friends is that they live too far away (40%). At the same time the share of elderly persons who will choose to go to live closer to relatives and friends in the case of decline of health situation is very low (6%). This tells us that they will choose to defend their independence even at the cost of social relationships. In relation to social items, the information we collected in Chapters 2 and 5 tells us that the introduction of telematics can also be a potential threat for those social categories that are less well off or that experience some impediments of a physical nature, such as the elderly or the disabled. In the design, particular attention has to be paid to allowing for social relationships.

It is immediately evident that not one of these items can be improved through the sole and simple introduction of telematics applications. The reality is very complex and no deterministic position can be assumed as a departure point. Notwithstanding this, the applications of telematics we discussed in the previous Chapters can be usefully employed to partially reduce the reported deficiencies. In the field of design, this means integrating telematics applications into a new design of the socio-spatial context that is able to realise positive potentialities and reduce the possible negative consequences. This concerns not only the design of equipment and software, but also the positioning of equipment (and services) in relation to users and the availability of alternatives to match different (and often contradictory) needs and changing circumstances (Caso, 1998). Recent conceptualisations on designing for the ageing society fit well with this task. Accordingly, the new cultural environment in which design for the aged should be placed, leaves behind the idea of design specifically targeted on the needs of elderly people, to welcome more integrated concepts (design for all, universal design concept) aiming at the design of socio-spatial settings which are able to accommodate different social categories with minor adjustments during the course of their life (i.a. Ambrose, 1997; CIB/TG19, 1997).

The task is to design this area as a neighbourhood of the network-city, and within this are two steps. Firstly, the socio-functional context of this area has to be modified and re-organised including the introduction of telematics applications; secondly the potentialities of this re-organisation for the physical context have to be interpreted by a new design. This task refers to the design of the complexity of a future hybrid space where the physical context and the virtual environment influence each other and both are integrated into a single environment of action. In our case applications of ICT and the related design items are intended to be beneficial to the elderly people living in the area. This is obviously an abstraction, since the seniors we interviewed are only a part of the total elderly population of the area. Moreover, many other social categories live in Meerzicht, and they have their own needs and desires, both as groups and as individuals. Nevertheless, within these limits, our operation is significant as far as it is intended as a design experiment.

For the formulation of the design programme it is important to consider the territorial scale covered by the operation. In principle, a new design for Meerzicht should involve the territorial scale of the neighbourhood. However, as we deal with a neighbourhood of the Network City, we cannot limit our attention to this scale. We have to take under consideration the relationships with higher and lower scales as well. This is particularly important as we consider telematics applications, for they are tools whose main characteristics are to establish connections between territorial scales: any place can be connected to any other place in the network. Therefore, the formulation of the programme has to take into consideration the relationship between Meerzicht and the wider territorial scales, the neighbourhood as an unity, the several districts forming the neighbourhood and the relationships between them, the scale of the building, the dwellings and the other facilities, as well as urban furniture.

7.4 Socio-functional re-organisation in Meerzicht

The residential function is predominant in Meerzicht. Any hypothesis of re-organisation of the socio-functional context in this area has, therefore, to be focused upon exploring the possibilities of establishing different relationships between dwellings and facilities. Which alternatives are possible to the present modalities of accessing services? As many alternatives can be introduced by applications of telematics, which are the possible locations of 'access points'?
The position of the performing places for telematics activities in the area have a central importance for the (re-) design of dwellings and of the neighbourhood. In a previous Chapter we have already investigated the range of possible locations for tele-activities. The choice of the right combination for Meerzicht depends on the specific items related to the area and the interpretation of these items by the designer.

The sample interviewed mentioned health-care, shopping, information, especially asking for forms, housing monitoring and control, and surveillance as the services/activities for which they think telematics could be relevant. But, also such applications as video-telephony and others supporting personal communications can be important especially for those persons with relevant mobility impairments. Applications such as tele-work, leisure tele-activities, tele-education, and tele-banking are not often mentioned, but they could become more important for the future cohorts of the elderly. Furthermore, they could be relevant applications for other social groups in the area.

In the following stages we are going to particularise, (for the case of Meerzicht), the operations we made in Chapter 2. Briefly, we are going to look at the existing functional and social programme in order to compare it with an alternative programme based on the introduction of telematics applications.

Figure 5 The position of urban functions in Meerzicht.
7.4.1 Functional items

The description of the functional structure of Meerzicht will be done by considering the traditional distinction in living, working, supportive facilities, and transportation. Figure 5 shows the position of functions in the area.

Living in Meerzicht

Meerzicht is a typical residential settlement of modern times, where the different urban functions in the area are not integrated, but segregated, in space. The residential function is the main part of the neighbourhood and it is exclusive in regard to other functions. Only in the central part of the neighbourhood are the dwellings mixed with other facilities, mostly belonging to the distribution sector. Here some apartments are built above the shopping centre in the proximity of the railway station.

The shopping centre in the central part of the neighbourhood is the daily destination for the majority of the trips the older inhabitants of Meerzicht make. Other trips have as destinations places located in the city of Zoetermeer, especially the city centre, or elsewhere in the region. These trips are made to reach a facility or for social purposes. To carry out these trips is not always easy for people. Especially those persons among the elderly population with some mobility problems, psycho-physical impairments, lack of transportation facilities or little community support, will face the greatest impediments. The survey we conducted showed that, above all, the inhabitants of the low-rise area experience more problems in making these trips. Indeed, their evaluation of the functional system of the neighbourhood produced a lower score than in the other areas. The physical conditions in the low-rise area can be the reason for this difference as we observed that a large road (four lanes) acts as a barrier between the low-rise area and the rest of the neighbourhood, thus separating people from the central area where the most services and the railway station are located. Consequently, the elderly inhabitants of the low-rise area have to make a greater effort in order to reach facilities.

Applications of telematics can be usefully employed to bring services closer to inhabitants diminishing the relevance of these impediments depending on difficulties in changing scale, as an alternative to the traditional modalities of accessing facilities. This requires a re-thinking of the built environment in Meerzicht, since the present structure has to be adapted in order to accommodate spaces necessary for the performance of tele-activities. The residential areas should assume the form of an environment in which the living function is mixed with the others. This mix of functions can be realised by introducing virtual equivalents of physical services. Yet, the introduction of new activities in a context designed for traditional domestic activities implies a demand for space and for new spatial qualities. In a previous chapter we have already discussed the possibilities for introducing tele-applications in residential environments, concluding that there are many variants by which this can be done. In particular, these are the different kinds of (neighbourhood) tele-centres and dwellings.

Working and supportive facilities in Meerzicht

Working is not a major consideration in old age, for elderly people are usually retired from the labour market. Nevertheless, many seniors would appreciate the possibility of continuing to be engaged in working activities, even after retirement age. A larger participation of elderly people in the labour market in the future can be expected, partly in relation to better health conditions of future elderly cohorts, and to evolution in the labour market (workers as free-lancers).

The present structure of Meerzicht makes it almost impossible to settle work activities in the residential part of the neighbourhood. Although many dwellings have a spare room, and this permits some flexibility, the performance of work in residential environments

Figure 6 Another view of the Meerzichtlaan.
requires several specific characteristics of a social and spatial nature that a solution such as the spare room could hardly meet. Home tele-working is not the only possible option. The tele-centre can be a valuable alternative especially for part time working activities, and to enjoy the support of personnel and the company of other tele-workers. To make possible the performance of working activities in the area the necessary conditions would have to be created.

But, concerning the other (supportive) facilities, some of them are concentrated in the central area of the neighbourhood. A change in scale is necessary in order to access other facilities. The facilities available in the neighbourhood seem to be enough for the common daily needs of inhabitants. However, it has to be said that the alternatives are located at city scale or at regional scale. Therefore, they are less accessible to the elderly of the area in case of need. Furthermore, a different functional organisation of the area by the introduction of telematics applications could improve the quality of life of the elderly inhabitants of Meerzicht.

For the quality of life of elderly people, the accessibility of some services is relevant. Among these are services offered by the urban functions Civil administration and management, Medical prevention and health care, Trading, Credit and insurance, Personal and collective security, and Leisure. The present situation regarding the availability of these services in Meerzicht shows that although the basic possibilities are present there is room for improvement.

To access the services of the Civil administration and management urban function, the elderly inhabitant of Meerzicht has to reach the city centre. The alternatives employed are usually the telephone and the public mails. Several tasks can be fulfilled at the post office or at the bank. However, these alternatives seem to be insufficient since one major concern of elderly people in Meerzicht refers to ‘asking for forms’.

The Medical prevention and health care urban function is present in the neighbourhood through a pharmacy, physiotherapy, and doctors. A health-care centre is located in the central part of Meerzicht, close to the railway station and to the service flats for elderly people. This centre has a pharmacy, physiotherapy, and doctors.

Some services for home care are located here as well. They concern nursing functions, while services of help with ADLs are located in a building close to the central railway station of Zoetermeer having a function for the whole city. These services are relevant for elderly people with problems of mobility. Data from the survey shows that these services are accessed on yearly basis. For more complete check ups, or for more complicated tasks, the elderly have to operate at a higher scale. The position of the nearest hospital is in an area close to the city centre.

Trading is relevant for the elderly so far as the distribution sector is concerned. Shopping can become a problem as the capacity for mobility and of carrying shopping bags decreases with age. In Meerzicht all the shops are located in the central area. Although the range of goods on offer is not very broad, they are sufficient for the daily needs of inhabitants. For special goods people have to change scale.

The banking services offered by the Credit and Insurance urban function are important for the elderly. In the central area of the neighbourhood there are some facilities of this kind. Furthermore, electronic payment is nowadays a common system for concluding transactions. For withdrawals of cash the elderly can use the cash dispensers located in the central areas.

Safety and security in public areas as well as in domestic environment is a common concern in old age. Also in Meerzicht the findings of the survey revealed the existence of this concern among the elderly population. However, there is no relevant data on specific criminal events in the area such as burglary or aggression. Therefore, this seems to be more a psychological concern. The central area gives the impression of being potentially dangerous more than do the other areas of the neighbourhood, for the little social control that can be exercised. Indoor safety is another important item in old age. No specific data on domestic accidents in the Meerzicht area has been found.

Leisure time acquires a greater relevance in the life of elderly people, for they are usually retired and have more time at their disposal. Research shows that the most leisure activities in old age take place indoors, especially in one’s own dwelling. Other research observed the
resilience of patterns of leisure activities (see Chapter 5). In short, patterns of leisure activities established earlier tend to remain over time. In Meerzicht the leisure activities are mainly performed indoors. For the outdoor activities there is a park and a green area. The sport facilities located at the northern border are also a destination for some elderly people, as well as sport facilities at the city level.

The services offered by urban functions like Education, training and research, Religion, and Culture have more a discretionary value for the quality of life in old age. Like Working, they are not a priority for elderly people, but they become very important if people are interested in them.

For instance, Education, training and research may become very relevant for these elderly who wish to improve their level of education after the loss of their main activity during their working years. The time made available by retirement and the improved health conditions for future elderly cohorts can tend toward a growing demand for these services. The survey we conducted in Meerzicht does not show any consistent demand for educational services for the elderly. This can be explained by the lack of interest of the present generation of the elderly in these items, which could change for future generations, and, also by the lack of such services. Services of Education, training and research are mixed with the residential environment at the lower level (primary schools). Other levels imply a change of scale toward the city or the region. The introduction of education services targeted on the third age is likely to find a market as the necessary conditions are created.

The sample of elderly people interviewed does not show any particular interest in religious services. However, faith is a very personal matter. For the believer, visiting the church service (for the follower of a Christian religion) is likely to be an important daily or weekly activity. In Meerzicht a church is located in the central area of the neighbourhood. People with lack of mobility or little community support may experience some problems in participating in these events. It is likely that alternatives are found on a personal basis, or that the Sunday programmes on TV are considered as good alternatives.

Culture is another function whose services are important on a discretionary basis. Some elderly people may consider participation in cultural events as a fundamental part of their quality of life. It is, anyway, difficult to understand what is meant by ‘cultural activities’. There is no real offer of cultural services in Meerzicht. The closest is a library located in the central area. To fulfil their cultural needs, the elderly inhabitants of Meerzicht have no alternative but to change scale.

Other urban functions have little relevance for elderly people, although some applications can be considered. Among these functions we can mention Production, Services to production, Defence and civil protection, Management and control habitat and environment, Tourism and receptivity, and Legal.

Production and Services to production can be important for these elderly who are still engaged in some work activities related to these sectors. Defence and civil protection and Management and control of habitat and environment are important in relation to the diffusion of information in specific cases. Tourism and receptivity can be relevant for these elderly who like to travel as tourists. The availability of some travel agencies is sufficient for these tasks. Legal can have relevance as the elderly are confronted by specific problems for which the availability of a lawyer is necessary. Although it can happen, this is likely to be a very marginal situation (at least in terms of frequency in time).

Transportation

Transportation includes three urban functions: Mobility of people, Mobility of Goods, and Information mobility. These three can be very relevant for the elderly for differing reasons.

Ability to retain individual mobility is a pre-requisite for quality of life in old age. The possibility of reaching places to join events or other people, or to carry out functional tasks, decreases with ageing. The support of the community is often fundamental in these cases. Individuals can use private or public transportation means. In Meerzicht the public transportation system is provided by a bus line, the train, and a system of ‘shared taxi’.

Transportation of goods can be relevant for the elderly as far as it permits the home delivery of items.
purchased. As elderly people have problems with bringing home the shopping, the possibility of having it delivered is a valuable alternative. There is no information about these services in Meerzicht.

Information mobility concerns the spreading of information. Apart from the traditional (physical) methods of exchanging information, alternatives very often employed are made available by technology. Telephone and television, above all, and increasingly telematics. It is likely that the most used means of accessing information in Meerzicht is the telephone, combined with physical access.

A new organisation for the functions in Meerzicht
The introduction of telematics can lead toward alternative ways of organising the presence of urban services in socio-spatial settings, according to the modalities we have already described in Chapter 2. In general, the new organisation can assume a networking character where the virtual delivery of services is parallel and complementary to the physical modalities of access. The question is not substituting physical activities with their virtual equivalents, but rather to realise a beneficial mix of physical and virtual services.

As we observed some services are more important than others for the well-being of the elderly. More attention should, therefore, be paid to these services, without forgetting those with a more discretionary value. All these services can be realised in Meerzicht with little space consumption by introducing telematics applications.

A central point in this re-organisation concerns the location of services in the area: the position of telematics performance places and the possibility of spreading some physical services, presently concentrated in the central part of the neighbourhood, over the whole Meerzicht area. The questions concern the choice of the location for telematics activities and the kind of services that can be physically introduced.

Concerning places for telematics activities several alternatives are possible as we have already described in a previous chapter. The dwellings in the area could be (re)-designed in such a way as to make possible the performance of different tele-activities without interfering with traditional ones (Caso & Tacken, 1993).

The user should be able to choose the preferred spatial configuration according to (changing) needs. Many dwellings in the area have a spare room, which could permit some flexibility. But, this may be not enough, especially if the concept of life-cycle housing is pursued. Which type of dwelling allows the elderly (or any other person) to perform tele-work at home? Which one makes health-care possible? What about those parts of the dwelling which become under-used after the demise of their original functions? Some elderly people will need to realise several possibilities at home since they need to perform them on regular basis, such as the chronic patient who needs constant monitoring, while others will prefer to make use of them less regularly by choice or because they lack of resources. In these cases an alternative in the neighbourhood should be found.

A possible option is the (neighbourhood tele-centre), which offers space and facilities for the performance of tele-activities, as well as skilled personnel. The tele-centre could host a health care centre, machines for tele-shopping or tele-banking, video-telephones, monitoring of dwelling functions and surveillance and a meeting place. The same tele-centre could also host rooms for the performance of tele-work or educational activities which may be rented also to the elderly who intend to get involved in these activities. Other possibilities concern (tele-)library and a small conference hall where a number of (remote) events can be received. (Caso & Tacken, 1993)

The necessary facilities to make the performance of tele-activities possible have to be realised in these locations. They concern the technical equipment, the availability of supporting personnel, the necessary spatial and architectural characteristics for performing the different tele-activities and the layout of performance places.

Among the physical services to be de-concentrated and spread over the whole neighbourhood, we can surely consider some shops and bank offices, especially if they can base a large part of their functioning upon telematics. In other words, there is no space for introducing traditional shops in the area, unless by substituting some blocks of housing, but shops can also be understood as point of access to the system, where goods can be seen, maybe with telematics support, and ordered, and subsequently delivered.
7.4.2 Social items
The state of the social environment in Meerzicht generates some concern. The information about social items that we gathered with the survey shows a lower degree of satisfaction if compared with other items. This phenomenon is more evident among the elderly inhabitants of the low-rise area, who show a lower appreciation of their social environment than other dwellers in other areas.

Clear relationships seem to exist between satisfaction with social contacts and the health situation. The item most often mentioned concerning impediments in visiting relatives and friends is that they live too far away, and this item is often associated with poor health conditions. Sometimes the problems are perceived as too difficult to be overcome. In this situation the elderly simply give up social participation preferring to stay home. It is quite easy to see how this situation negatively affects the quality of life for these elderly people.

The functional and the physical structure of an area certainly have an influence on the perception of the social qualities of a certain setting by its inhabitants. This is quite clear in the case of Meerzicht. Indeed, the low-rise area, which scores the lowest appreciation from its inhabitants, has a physical structure where clear points of social attraction are missing, places where people can encounter each other. This is aggravated by the lack of functional variety in the area. If the possibility of carrying out different activities in the same place is one of the mechanisms that stimulate social interactions, this is missing in the low-rise area of Meerzicht. Instead, in the high-rise area, the large courts within the blocks facilitate some social interactions, and the social context is more appreciated than the other areas. The central area is the place where services are located, and it is, therefore, the focus of the Meerzicht population. Here the mechanism of social interaction based on functional attraction produces a better appreciation score than the low-rise area, but less than the high-rise one. One interpretation of this can be that the presence of services, and the related usage by people – is not enough to guarantee positive interactions. This has to be organised in a socially sound physical structure. The shopping centre is surely an attraction point where people encounter each other, but it is designed only in accordance with its function. Gathering places for people are missing.

Elderly people are particularly sensitive to the social qualities of the environment. The fact that their reactions to our survey emphasised these discrepancies between different parts of the same neighbourhood reveals the existence of potential problems in the social context of Meerzicht, which a new design for the area could help to meet.

Obviously, there are many other factors that play a role in the definition of the satisfaction of people with their social context. For instance, a certain level of education and culture can produce higher expectations that are more difficult to meet. Some ethnic groups may have a different understanding of sociality and be satisfied with differing items. The availability of private transportation means, in general, the ability to make trips is a very influential factor in the perception of the social qualities of a context. The role of transportation as territorial adapter can conciliate the different scales also concerning the participation in social events.

Implications of social aspects
The most common alternative employed by elderly people in Meerzicht for keeping contacts with relatives and friends is the telephone. This has a double function. Substitution for physical contacts, and exchange of information to support physical contacts as well. The same can be said for the use of telematics for social contacts. On the one hand telematics applications act as a substitution for physical contacts for social and functional purposes. On the other hand telematics can be usefully employed to get information for supporting the organisation of trips and the performance of activities.

Both modalities are potentially of great help for elderly people, since they can permit and facilitate certain forms of social participation even when the ageing process increases the relevance of (physical, functional, and social) impediments. Elderly people in Meerzicht can also enjoy these opportunities. Nevertheless, these two modalities also present some potential risks that require careful consideration. This is especially the case when telematics is used predominantly as substitution for physical contacts.

Elderly people with constrained mobility, or even
homebound, could find in telematics applications a helpful tool to maintain social contacts with relatives and friends. At the same time, since they rely on caregivers for most physical contacts, they can become more isolated. If they can also be assisted remotely by telematics, the need for regular visits by caregivers may decrease. It is, therefore, important to consider these aspects in order to avoid the introduction of telematics applications producing undesired consequences. This problem can also be tackled in the design field by paying attention to the position of places of social interaction in relation to the dwellings of elderly people.

The relationships with physical services are elements of great importance for the social life of elderly people. Visits to shops and other services may acquire an added value for elderly people. The functional motivations for visiting services, the satisfaction of functional needs, is paralleled, and, often surpassed, by the social motivation of meeting other people. Elderly people go to shops, post offices, and banks also to exchange some words with other clients, or with the supplier, rather than to perform a functional activity. This behaviour belongs to the domain of desires and it is not expression of functional determinants, although it can be a combination of the two. The physical accessibility of services is, particularly in old age, an important issue for the quality of life. Virtual alternatives, although valuable and appreciated, are less important than for other categories with tighter time-space budget and high capacity for mobility. The design of the residential environment should take this item into account.

Safety and security in the public environment is another important issue for social aspects. As already mentioned, in Meerzicht, as in other places, elderly people have expressed a certain concern about safety and security. The introduction of systems of tele-surveillance could improve the feeling of safety and security on streets, thus positively influencing their outdoor social behaviour. Also, we have to comment that this can be a double-edged sword: more control can also be interpreted as a danger to the privacy of citizens.

7.5 Design programme

The formulation of a new design programme for Meerzicht is a step toward the design of this area as a neighbourhood of the network city, where a combination of physical and virtual services are introduced for the benefit of the elderly people. The main theme for the design is, therefore, the realisation of a mixed socio-functional environment where housing and services are combined in different ways. The modification of the existing socio-spatial structure should be designed in order (a) to introduce new possibilities, and (b) to match detected deficiencies. As the Network City is the reference environment for the design, it will be convenient to start by considering the relationships between different scales of intervention. In doing so, we shall proceed from the outer toward the inner, considering first the relationships at a higher scale.

7.5.1 Regional/neighbourhood scale
The areas of Meerzicht that can play a role at city level or even at regional level are the ones where physical accessibility is greatest. The areas around the railway station and along the Meerzichtlaan have this property. These areas could be the location for more large-scale services, where physical accessibility is important. For instance, larger tele-centres hosting a complexity of functions such as tele-work places for professionals, tele-events, meeting places and better equipped health care centres. These services may attract people from other neighbourhoods as well. Other functions can be related to the large-scale distribution sector, such as large supermarkets.

The same areas are important when we consider the neighbourhood as a unity. They can fulfil the function of being attraction places for the inhabitants of the whole neighbourhood. For this reason they should be designed as places for meeting and encounter around services with significance for the whole neighbourhood. In addition to the functions quoted above, it is possible to locate here spaces for tele-education and for leisure (tele-)activities. A more representative selection of shops can be gathered in a 'plaza' together with some physical bank offices.

7.5.2 Districts
The scale of the district can be especially important for the elderly with reduced mobility. At this level the residential function is dominant. The districts should be re-designed in order to realise an environment in which living and other facilities are mixed. This can be done
with little space consumption by means of telematics applications. Some facilities can be realised in peoples' homes or by introducing 'telematics machines' in public areas. These solutions belong to a lower scale. At the scale of the district a possible option is the small tele-centre having a supportive function, with a mainly local function. This tele-centre should host services whose attraction power is directed towards the dwellers of the district, thus, in principle, not producing extra traffic from other zones. These can be some facilities for tele-health care, a tele-library, access to municipal services, Internet connections, small cabins for activities needing more privacy or concentration, tele-banking or tele-shopping. Also some places to perform tele-work could be included in these small tele-centres, particularly if they are intended for occasional work. The presence of a helpdesk is very important especially for the support it can give to seniors.

7.5.3 Dwellings
In principle, all facilities can be realised at the scale of the dwelling. However, the home performance of tele-activities is only one option among others to realise mixed socio-functional environments. Tele-centres, too, can host many activities and also offering some technical support from skilled personnel. Nevertheless, the possibility of home performance is a valuable solution for those activities that individuals consider very important for the quality of their lives. Some elderly people will need to realise tele-activities at home because they make use of them on regular basis. But, it is not only a matter of individual choices, for better individual choices are conditioned by the personal evaluation of the surrounding context. In particular, the introduction of tele-activities in dwellings can be realised when specific socio-spatial conditions are available. Some tele-activities have more relevant requirements concerning their performance places, such as space consumption, degree of privacy, and/or concentration, compatibility with other (tele-) activities and relationships with other components of the household. This is especially the case for the introduction of tele-work, tele-health care, and for educational activities. The re-design of the dwellings in the areas, as well as the eventual design of new dwellings, should take these items into consideration, aiming to create the necessary conditions for the introduction of tele-activities. At the same time, the design should assume a more dynamic perspective. That is to say that configurations suited for the realisation of drives and needs in a certain life phase, may not be adequate in another phase. For instance, one relevant problem for elderly people is often the size of their dwelling, which has become too big as other members of the household have gone, and thus difficult to manage. Introducing extra space for the performance of e.g. tele-work may increase this problem after retirement. The spatial solution to home tele-work cannot be the simple adding of extra rooms, but has to be found within a wider framework, allowing the flexibility of configurations towards other uses.

7.5.4 Urban furniture
Another system for the realisation of a mixed functional setting in Meerzicht is to introduce urban furniture as 'access points' in public areas. This system can support the performance of some activities requiring short duration and little privacy and/or concentration, such as some tele-shopping and tele-banking applications, or tele-information. Applications of video-telephony could be also included. These access points can take the form of a sort of telephone booths, equipped with a monitor and a keyboard. They can be located in any point in Meerzicht, and used in combination with other modalities for accessing virtual spaces.

7.5.5 Matching problems
The investigation of the possibilities at different scales of Meerzicht shows that there are many, often overlapping, systems for realising mixed functional environments. The choice of which combinations to introduce can be made by considering the specific situations in the neighbourhood in order to match the detected deficiencies. We distinguished three areas in the neighbourhood: low-rise, high-rise, and central area. Each one of these areas presents its own characteristics and problems.

The main concerns in the low-rise area refer to the state of social context and to the functional environment. In this area it is necessary to improve possibilities for meeting and exchange among people by creating places of social aggregation. The problems in the functional environment can be relieved by introducing a mix of physical and virtual services to be realised partly in some dwellings and for the rest by introducing small tele-
centres and access points in public areas. Some residential streets can get a more mixed character by introducing other activities like workshops (or tele-work places) and shops, thus making these spaces more alive and attractive both for elderly people and for other social groups. This operation will require the re-design of the dwellings along the streets concerned, and the modification of zoning regulations to permit the performance of small-scale, quiet, productive activities in residential areas. This means that we do not intend to intervene in each single dwelling in the area, but to give greater importance to certain residential streets. This is in order to create an axis of attraction within the districts in order to locate the access points to virtual spaces and some physical facilities. Small tele-centres will be positioned in strategic places along these axes and will offer a variety of services as already described. They will have a social meaning too, becoming a daily destination for many older people. The social significance of tele-centres can be improved by designing the centres as locations offering, besides services, the possibility to e.g. sit and meet other people in an attractive environment both inside and outside.

The main problems in the high-rise area concern the quality of the physical environment. The dwellings are not in question. They are good enough for the inhabitants. It is more the perception of a lack of qualities in the whole. Indeed, there is an evident desire for a more recognisable physical context as shown by the thematic re-design of courtyards. The social and functional contexts, instead, are considered acceptable although there is room for improvement. Therefore, the problems in the high-rise area are very different character to those in the low-rise area. Thus, the task is to re-model the lay-out of this zone where telematics access points can be used as tools to improve the quality of the physical environment. The buildings hosting new services can be introduced having this idea in mind. In this area a pattern of shops, workshops, tele-work places, places for other services, and small tele-centres with supportive functions for the area can be spatially organised to integrate the pattern of high-rise buildings in order to improve its quality. This pattern of services can be combined with new dwellings designed in accordance with the life-cycle idea. The problems of the quality of the physical environment are not only a simple question of shape, but also of accessibility:

obstacles, the feeling of safety and security in an outdoor environment and social control. The possibility of bringing some services in the dwellings can be used as an opportunity to modify the lay-out of the high-rise blocks towards a more varied configuration.

Most problems have been detected in the central area of the neighbourhood. Here the problems are of both a social and a physical nature. Although it is the daily destination for many inhabitants of the neighbourhood, this usage by people does not seem to produce social inter-actions. At the same time, the elderly inhabitants of this central area find it quite unattractive, basically due to the unclear relationships between the elements and its unfriendly design. The largest part of the area is occupied by parking lots, and the shopping centre is a dark place in which orientation is difficult. To the contrary, the functional environment is good, mainly because most services in the neighbourhood are concentrated in this area. A more global redevelopment seems to be necessary in order to improve the social and physical environments in this area without losing its functional qualities. The central area presently plays an important role in Meerzicht, being the centre of attraction for the whole neighbourhood. However, even if the functional dependence on the central area can be reduced by spreading services throughout the whole of Meerzicht, this area will maintain its importance as a meeting-place at higher scales: for the neighbourhood life, and as scale exchange to and from the city/region. Indeed, due to the presence of the railway station that increases accessibility, the central area holds a particular value. The design programme for this area should exploit this property, by introducing virtual and physical functions that are relevant at higher scales and that can be significant for people from other city areas as well. At the same time these functions should be introduced in a design that makes the zone attractive also for social purposes. A major tele-centre could be combined with the railway station facing a 'plaza' where physical facilities (mainly shops) can be realised. Some dwellings in the area, both low-rise and high-rise, can be re-designed following the same criteria to be used in the other areas.

Another particular site in the neighbourhood is the Meerzichtlaan. This street cuts Meerzicht into two parts, separating the low-rise area from the central and high-
rise area. The breadth of this street (four lanes, with central reservation) is probably the main cause of the problems for elderly people in the low-rise area to reach the facilities in the central area. Furthermore, this street is only fully used during short periods of the day, namely, the rush hours. Therefore there is room for intervention in this street, which can be narrowed and designed as a ‘boulevard urbain’ using the space saved to locate (virtual) facilities. Since this is the main street of the neighbourhood and it allows better accessibility than other areas, it should be designed to support traffic from the whole neighbourhood and also, in part, from the rest of the city.

Social items are very important for elderly people. Although the potentialities for telematics can be relevant in improving the quality of life in old age, they can be insufficient if they are not introduced in a structure that can reduce potential risks. The risks are mainly related to the experience of isolation if physical contacts are replaced by their virtual equivalents, and to the inability of accessing electronic spaces if the elderly person lacks resources. The design programme described aims to counteract these potential risks by stressing the importance of socially-sound choices for the design. In short, we can state that social aspects give the limits within which it is possible to introduce innovations. Telematics applications can greatly contribute to improve the functional context, but (physical) alternatives should always be present to make it easier to meet the desired behaviour of people.

7.6 Summary and conclusions

The formulation of a new design brief is a step towards the task of approaching new concepts and strategies of urban design. Taking into consideration the Network City, one way of doing this operation is to consider which design programme can be formulated in relation to the possibilities offered by telematics applications. This chapter attempted to formulate a design programme for the transformation of a specific residential socio-spatial setting (the area of Meerzicht-Zoetermeer) in a neighbourhood of the network city where telematics applications are introduced for the benefit of senior citizens. This operation has been based on the findings of the survey presented in the previous chapter and by the knowledge about design aspects of city-telecommunications relationships developed in the first part of this work.

We found that different scales are important for the development of the design programme. Proceeding from the outer to the inner we focused on the role of Meerzicht in relation to the city and the region, the neighbourhood as a single entity, the districts, the dwellings and the buildings and the urban furniture. In each of these territorial scales, there are possibilities for telematics applications. The choice of the combination to be introduced depends upon the specific items/problems detected in the area. The programme we proposed is based upon five points:

— Redevelopment of the central area. The centrality of this zone will be reinforced by locating large-scale services and by creating a favourable environment for urban sociality.

— Introduction of poles of supporting activities for local communities in the districts. For this operation the telecentre option seems to be the most convenient one.

— Introduction of a more defined hierarchy of connecting routes in the districts. This can be done by creating a system of physical routes that should assume a clear function within the area. The poles of activities will be connected to this system.

— Leaving to people the decision of modifying their dwelling for the introduction of the home-performance option. Nevertheless, private interventions in relation to the connecting system of routes mentioned in the previous point should be facilitated in order to reinforce the hierarchy.

— Paying specific attention to the social qualities of the design at all scales.

The next chapter will present a design workshop in which groups of designers tried to develop some of these points taking into consideration the possibilities offered by telematics. Our design proposal will be presented in the Ninth Chapter.
Notes
1. Here we refer to the semantic distinction between the terms complex and complicated. The latter can be seen as a sum of different items, while complex relates to the whole. Complicated is in opposition to simple, while complexity may include simplicity. The opposite of complex can be singular. This is relevant since it reveals a different cultural approach to the design of socio-spatial systems. See Atlan (1981) and Stengers (1987).

2. This Design Studio is a joint initiative of the Urban and Regional Planning Group at the Faculty of Architecture of the Delft University of Technology and the Dutch Ministry of Spatial Planning, Housing and Environment (VROM). See Drewes (1998a).

3. In the meantime the Library has been closed, reducing cultural facilities in Meerzicht.

4. Houses that can be adapted over time with minor adjustments according to the changing needs of its inhabitants.
8. The Design Workshop
8.1 Aims of the design workshop

The main goal of this work is to supply designers with information on the relationships between information and communication technologies (ICT) and the physical dimension of socio-spatial settings. To reach this aim we carried out several steps that are summarised in the research scheme From Telematics Innovation to Design presented in Chapter 1. Briefly, the hypothesis is that telematics has little direct physical significance while the indirect consequences are much more relevant for designers. Therefore, we investigated the changing functional and social contexts under the pressure of telematics innovation, placing it in the framework of the network city. Referring to residential areas, the significance of telematics for people and for spatial settlements has been expressed in terms of teleactivities made possible and for which a number of qualitative design guidelines have been formulated at different scales of design. In the second part of the research path we have focused on the social group of elderly people, detailing their situation in an existing socio-spatial setting: the Meerzicht neighbourhood in Zoetermeer. The information gathered from the survey has been used to formulate a new design programme for the future Meerzicht in which telematics applications are introduced (also) for the benefit of elderly people.

The need to test the relevance of produced knowledge for designers originated the idea of carrying out a design workshop. The aim was to test the knowledge produced by exploring how the design items developed during the research can face concrete problems in a real socio-spatial setting and how they can lead toward improvements in the present situation. The real situation chosen for the design workshop was Meerzicht, because of the specific knowledge already made available by the survey.

With this operation we did not expect to obtain very developed and detailed design proposals, which we considered to be impossible due to the short time available and to the very limited familiarity of the participants with the topic of telecommunications and design, but, rather to check several points:

- to detect eventual difficulties and problems in transferring the information produced to designers;
- to see if the information produced made possible the development of different interpretations and choices in the design, although starting from common assumptions;
- to check if any of the design proposals was leading to unforeseen solutions contradicting the basic assumptions, which could show the existence of a 'hole' in the theory.

All in all, the experience of the design workshop can be assessed positively, since the design responses we got were different, but all were consistent with the facts presented. No specific misunderstanding of the transmitted knowledge was detected, although some participants were rather sceptical of the relevance of ICT for design. Nevertheless, some problems were evident, mainly due to the difficulty of building a bridge between research and design in this field. It was difficult for some participants to face the uncertainties due to the multiple choice available to designers to realise specific goals, and to connect the different possibilities with their socio-spatial implications. This was considered to be mainly a matter of communication.

8.2 Participants and venue

The design workshop took place at the beginning of June 1998 at the Faculty of Architecture of the Delft University of Technology throughout a whole day of intensive work. The participants we invited had different backgrounds. Since one criteria for the choice was to have already built some understanding regarding the matters at issue, the choice fell on Ph.D. students in design matters and on students of the Design Studio The Network City VROM. The workshop was also attended by other students and professionals who were interested in the topic Telematics Applications in Residential Areas, which was the title of the workshop.

One week before the date of the workshop all participants received a 40 page introductory paper in which the main items of the relationships between telecommunications and the design of residential areas were summarised. This paper contained the main results of the research activity we have carried out on the topic, and it was divided into four parts:
1 the presentation of the workshop;
2 relationships between telematics and design;
3 the fieldwork in Meerzicht;
4 appendix.

The third part, about the fieldwork in Meerzicht, contained the main findings of the survey, the discussion of these findings, and the design items to be dealt with in the design workshop. To make it easier for the participants, the design items where summarised in the form of questions, to which a more detailed explanation followed:

— Where do we locate telematics performing places?

— How do we (re-) design the (new and existing) dwellings in the area?

— What alternatives are there to the home-performance modality?

— How do we match existing and potential deficiencies in the social context?

— How do we improve the functional context?

— What solutions are there for the central area?

— The Meerzichtlaan is experienced as a barrier cutting the neighbourhood into two parts. How do we deal with this problem?

The participants were asked to give answers to one of more of these questions in the design field, freely combining the possibilities presented to them in the introductory paper. Their task was to investigate the ways of confronting desired and possible futures. The desired futures can be deduced from the findings of the survey, while the information produced by the research was presented in terms of possible futures. They were asked to interpret the data in a ‘dynamic way’³, and operate by design to create the conditions for which the situation of elderly people in the Meerzicht area could be effectively improved by introducing telematics applications.

8.3 Organisation of the workshop

The workshop was organised in several stages. After a lecture in which the main information contained in the introductory paper was presented and some points for attention were clarified, the Meerzicht area was described with the help of maps and slides. Then the participants joined freely in small groups to discuss the presentations and the information they had received and began to elaborate their proposals. At all times we were available if any further information was needed⁴.

Figure 1 Participants at work.

We gathered at noon for a first briefing to discuss the direction of work that each group was taking. The debate that arose from this first meeting was particularly interesting since it mainly concerned the relevance of different approaches in relation to the goals. After this discussion the groups proceeded with their work.

Figure 2 A work-group discussing a proposal.
At the end of the day they presented the proposals and defended them. A final debate concluded the design workshop.

8.4 The proposals

The participants who presented a proposal were nine in all, divided into four groups. A description of these proposals follows.

8.4.1 Supporting communities

The authors of this proposal focused their attention on the possibilities of support local communities by introducing telematics applications. They investigated the possibilities at the district level. Their proposal is to subdivide the whole area into smaller districts, each one of them provided with a small tele-centre. In this way the (elderly) inhabitants of the area will be less dependent upon the central area of the neighbourhood for many services, which will be located at closer distance to their dwellings.

The physical accessibility of the tele-centres is very important. This should be stressed by positioning the centres along clear and attractive routes, especially for pedestrians and cyclists. These tele-centres should host different (tele-) activities, in particular work, library, information, and support social (tele-) activities. A helpdesk will be helpful to people with little computer literacy. Eventually, some tele-centres could be equipped with services that are also relevant at a higher scale.

Finally, all tele-centres should be connected into a single network, both physically (by means of routes), and virtually. In the low-rise area, the tele-centres should also fulfil the function of giving some order to the physical structure by becoming attraction points for people. They should be designed as clearly recognisable elements.

8.4.2 Boulevard urbane

This proposal takes into consideration the whole neighbourhood. Telematics applications are used to reinforce the role of those areas of the neighbourhood that are relevant for the whole of Meerzicht, giving them a new meaning. The goal is to improve the relationships between the parts and the whole, creating equipped places of attraction for the neighbourhood inhabitants. To this end the proposal focuses upon the places in which accessibility scores more highly, namely the central area around the railway station and the Meerzichtlaan.

The section of the Meerzichtlaan devoted to car users is narrowed from four into two lanes, and the space gained is used to place a series of telematics access points and physical services inhabiting a pedestrian area. In this way the Meerzichtlaan should acquire a new meaning for the inhabitants of the neighbourhood, becoming a place of attraction and social encounter.
The area in front of the railway station is wholly re-developed and transformed into a 'plaza' where a main neighbourhood centre, tele-work centres, and shops are located. The two developments, along the Meerzichtlaan and in the central area, cross each other creating a second urban axis able to integrate the different parts of the neighbourhood in a better way.

According to the authors, this proposal should change the meaning of the neighbourhood for the inhabitants. Meerzicht is no longer an extension of the city centre, a 'sleeping neighbourhood', but becomes centre in itself, one of the centres of the network city where it is possible to live twenty four hours a day.

8.4.3 Nodes
The author of this proposal followed two parallel approaches, according to the scales of intervention. In the first she focused on the role of telematics in improving the situation of elderly people. If the decreasing capacity of mobility in old age reduces the action space of seniors, then it is at the level of the district that intervention is needed. In the second approach she considered the neighbourhood as a single entity, centring her reasoning on the barrier-effect created by the Meerzichtlaan.

Figure 7 A new urban axis proposed in 'Boulevard Urbane'.
Figure 8 and 9 Nodes.

The provision of small tele-centres at the district level can improve the quality of life of elderly people by making services more easily accessible to them. Apart from their functional significance, these tele-centres should also play a social role for elderly people, becoming points of attraction in the district.

To face the problem of the barrier-effect of the Meerzichtlaan, the author adopted a rather radical solution. The street is dug up in some places to free the ground from impediments, obtaining a spatial continuum across the whole neighbourhood. Big structures are placed at the street intersections along the Meerzichtlaan, organised on two levels above the ground. The first level is occupied by the new Meerzichtlaan, while the upper level houses virtual and physical services that are relevant at the neighbourhood scale. The free space on the ground can be designed for multiple tasks: connections between different parts, a green area, or a small square with meeting function in outdoor space.

Figure 10
Three-layered structures are located at street intersections on the Meerzichtlaan.
8.4.4 General stores connected
This proposal focuses upon the local scale of the district for supporting elderly people by the application of telematics. It stresses the need of associating telematics access points and other (physical) services with a structured pattern of pedestrian/cycle access. The basic idea is to upgrade local access to facilities and downgrade higher level access.

The possibility of bringing a variety of services closer to inhabitants by introducing telematics applications has (also) the effect of increasing the relative importance of slow transportation modes in contrast to faster modalities. This is a reason for stressing at local level the relationships between slow mode routes and physical access to facilities.

An organised system of pedestrian and cycle access over the whole area provides structure. Attached to the structuring elements, the ‘general stores’ are sort of telecentres hosting small-scale mixed facilities providing access to virtual spaces, and fulfilling a function of meeting places.

8.5 An evaluation
By way of conclusion, the workshop highlighted two different approaches to the topic of introducing telematics applications in the Meerzicht area for the benefit of elderly people. One was the consideration of the neighbourhood as a whole. These solutions were searching for a new sense at the level of the neighbourhood while trying to solve the tensions between the parts and the whole. A second one focused more on the quality of life in the single districts, trying to support local contexts, rather more than looking at the neighbourhood as a single entity.

In both approaches telematics applications and the position of access points were seen as an opportunity to bring services closer to inhabitants, and to create occasions for social encounters. This was considered to be extremely positive for elderly people, whose reduced capacity of mobility increases the difficulties of managing activities on larger scales. Significantly, no one considered the introduction of services at local level as a substitution for services at larger levels. The positioning of, for example, tele-centres in districts was not associated with a change of functions at higher levels, although the higher scales were considered to assume a different value. The basic idea seems rather to consider telematics as a way to enrich the daily life of individuals by increasing their possibilities to choose a preferred modality.

A common assumption in all the proposals was the role of tele-centres in fostering social life. But, this always happened in relation to a change in the structuring elements of the neighbourhood. In substance, it was clearly stated that telematics applications alone cannot significantly improve life conditions, but they have to be introduced in a design that facilitates the exploitation of the potentialities of tele-applications. Quite remarkably, in all the projects the search for the synthesis was made by relating the design and position of telematics access points to access routes at different scales.

Another common element referring to the social significance of tele-centres was the idea of combining virtual services with physical ones. This was realised in different ways: combining services in the same facility, as for tele-centres in districts, or creating public spaces
in which different facilities were introduced side by side, and that would be designed to support social encounter.

Concerning the general goals of the workshop outlined in the first section, no particular problem was detected in transferring the facts to the participants. Some participants were in principle sceptical of the idea that the introduction of telematics could lead to a re-design of the physical environment. The discussion served also, to better clarify the limits within which this could happen, and at the end no relevant conceptual discrepancy was noticed.

The presented proposals showed a healthy, although, not particularly broad, variety of solutions all in consequence with the basic assumptions of the workshop. This was considered very positive, since it was a sign of flexibility in the theory that was in no way working towards a specific final result. The participants were able to choose from different options, and they did this quite freely. Nevertheless, the solution of the small tele-centre to support local communities was quite often used. In contrast, the introduction of tele-activities in the dwellings of the people concerned was not considered. A possible reason for this is the specific situation of the case study considered. Being an existing neighbourhood, Meerzicht conditions the choices of the designers. Therefore, a possible conclusion: as telematics makes possible a broad range of options to intervene in socio-spatial settings, the final choice is very much dependant upon the specific socio-spatial situation and on the goals to be pursued.

Figure 13
A moment in the group discussion.
Notes

1. In the meantime, the knowledge we produced from this research is also being tested in other design projects by students of the Design Studio (The Network City VROM). These projects cover a variety of spatial situations both as themes and scales (see Caso & Fernandez Maldonado 1998 a & b).

2. Although many participants have already had the occasion to study this topic, the difficulties of translating available knowledge in design items are still significant.

3. The survey gives a picture of the present situation that should be taken as a point of view towards future developments. In other words, the next cohorts of the elderly will be much more aware of the possibilities of telematics for the quality of their lives, and certainly more used to employing computers for a number of tasks.

4. Olimanda Caso and Mart Tacken.

5. This session was chaired by Prof. Dr. Paul Drewe.

6. Femke van der Brink, Marjolein Peters, Luisa Maria Calabrese, Asaf Friedman, Engeli Kummeling, Ana Maria Fernandez Maldonado, John Heintz, Marjolein de Jong, and Hugo Molenaar.

7. Femke van der Brink and Marjolein Peters.

8. Presented by Luisa Maria Calabrese and Asaf Friedman.


9.1 Design task

The goal of the design proposal is the re-design the area of Meerzicht as a neighbourhood of the network city, where virtual services are introduced for the benefit of senior citizens. This means taking into account their needs and desires. The main design theme is, therefore, the transformation of a residential area such as Meerzicht into a mixed socio-spatial setting, creating the ideal conditions for the introduction and the exploitation of telematics applications. The design programme developed in chapter 7 is the first step towards this task.

9.2 Design concept

The design intervention we propose for Meerzicht is in the first place the re-design of the relationships between the different parts of the neighbourhood. It concerns the design of routes of physical communication and the territorial scales, and the position and significance of telematics access points in relation to routes and scales.

To address this task we will operate on three design scales. We will consider:

1. the neighbourhood as a whole, and its potential role within territorial networks at city or regional level;
2. the districts as basic units within local networks;
3. the dwellings as departure and arrival points for the daily socio-spatial behaviour of people.

— At the level of the neighbourhood, the design interventions will focus on those areas having more significance for higher scales: the central area around the railway station and the Meerzichtlaan. These areas are the most easily accessible from territory external to the neighbourhood, thus acting as a connection/exchange between local networks and city/regional networks. When people want to change their scale of action, going to or leaving from Meerzicht, they have to make reference to these areas. Services that are able to attract people from other areas will be located here. The same areas have significance concerning the identity of Meerzicht. They are places well-suited for socio-functional activities at the neighbourhood scale. Particular attention will be devoted to the connections
between the two areas, in order to realise a single environment of attraction for the whole neighbourhood. The combination of the two areas will form the new heart of Meerzicht, a place of urban sociality and exchange characterised by more representative architecture able to define its own identity for the neighbourhood. To reinforce the centrality of this system we also propose to realise a second local axis perpendicular to the Meerzichtlaan cutting through the neighbourhood, from the park to the high-rise area. This axis will be intended for slow traffic modes (pedestrians and cyclists) facilitating accessibility to the central system.

![Diagram](image)

Figure 2 Networks supporting the movement of goods and people in Meerzicht.

— At the district level, the idea of supporting small local communities and individuals, particularly seniors, by introducing telematics applications will be realised by means of a network of small tele-centres of a supportive type. These will take a central position in each district and will have a function for the performance of the tasks of daily life. All tele-centres will be connected with each other by means of a network of paths for slow transportation modes. As a result, a sort of local ring will come about, along which the social life in the districts will develop with tele-centres being the attraction points at this scale. In the low-rise areas, the system formed by the tele-centres and their connecting paths will help to reduce the deficiencies in the social and functional environment that we detected within the survey. In the high-rise area the tele-centres will be combined with other physical elements, as life-time dwellings and other physical services, to realise an ordered pattern in the urban fabric. This will help to contrast the main deficiency experienced in this area, which is the low quality of the physical environment.

![Diagram](image)

Figure 3 Design concept.

— The lowest scale we shall consider is the scale of the dwelling. In principle, the possibility of modifying the dwellings in the area will be left open for private initiatives. People who need to perform tele-work or other tele-activities can decide to make some modifications to their houses. We propose to render easier the possibility of modifying those dwellings that have a strategic position in the new structure of the neighbourhood. Therefore, the dwellings located along the connecting paths at the level of the district (see above) will be modified or re-designed to participate in the new socio-spatial situation to be created here. For instance, it can be a matter of adding some extra space to the dwellings facing the paths in order to ease the performance of home tele-work. According to the needs of the inhabitants, these spaces can be also turned into workshops, small shops or other functions. The aim is
to enrich as much as possible the liveliness of these paths, providing the opportunities to carrying out activities throughout the whole day. This is especially important in the low-rise area. In the high-rise area the dwellings can be modified with the aim of varying the layout of the building blocks.

9.3 The design

9.3.1 The neighbourhood level
The design intervention at the level of the neighbourhood focuses on the central area around the railway station and on the Meerzichtlaan. These areas have a function of connection and exchange between local networks and city/region networks. The Meerzichtlaan will be narrowed from four into two lanes. The saved space will be used to introduce buildings hosting different functions, from dwellings to services and tele-work places. In figure these buildings are shown as a long, narrow strip having a height of three/four storeys, positioned as a screen between the low-rise area and the rest of the neighbourhood. This strip should have some degree of transparency to preserve view and physical continuity through the neighbourhood. The street intersection will be left free so as not to break the street network. The virtual and physical services hosted in the strip are mainly intended for the use of neighbourhood residents, but they can also become relevant for external users due to good physical accessibility. For instance, work places attractive to visitors can find a well-suited location in the strip. The dwellings to be introduced in the strip will be
designed according to life-time design concept. They will not have an own work-place, but they can hire or buy one located in the same building. Each dwelling will be equipped with a balcony or terrace, and the roof will be used as a semi-private garden. Aerial connections with built elements in the central area are also possible. The ground floor should be kept as much as possible free of volumes. Only services needing immediate accessibility from the street level will be allowed. These are mostly cafés and small shops, largely functioning with telematics supports. The combination of the mixed function strip with the narrowing of the Meerzichtlaan will confer on this street the aspect of a lively boulevard urbaine, able to attract people from the whole neighbourhood. In this way the Meerzichtlaan will be no longer experienced as a barrier between the parts of the neighbourhood, but rather as a connecting element in Meerzicht.

Figure 5
The interventions designed for the central area: the long 'strip' on the Meerzichtlaan - hosting dwellings and (tele)services; the system of three squares with the new buildings facing them; and the new commercial premises.

For the central area around the railway station we propose a more radical re-development. Indeed, according to the findings of the survey, this is the most problematic area in the neighbourhood. It misses physical structure of a recognisable order, and it has little social quality notwithstanding its functional centrality for Meerzicht. Therefore, we propose to demolish the existing shopping centre and the residential flats above it, in order to make room for a system of squares and for new buildings. These will host physical and virtual services as well as new dwellings. In particular, two special architectural elements positioned to form an L shape, one in front of the railway station and the other one along the Meerzichtlaan, will have the function of a major neighbourhood tele-centre. This will include the newly re-designed railway station, which will be combined with other services. The tele-centre will host functions that are important also at a higher scale, because of the physical accessibility of the area. Health care centre, tele-conferencing facilities, work places, space for tele-education and tele-library are among the most relevant services to be hosted in this tele-centre. Life-time dwellings will be located on the upper floors of the tele-centre facing the Meerzichtlaan. The ground floors will mainly be used for commercial functions. A new shopping centre will be realised as a large, low block connected to the two parts of the tele-centre and facing the main square (the 'plaza'). This will fulfil an important social role in Meerzicht as place of exchange and the centre of neighbourhood life. Shops surround the plaza. Additionally, the basement of the existing flat bounding the plaza on the north side will be converted into commercial functions. A second square is located on the roof of the shopping centre. This square has direct access to the neighbourhood tele-centre and the railway station. A third square, connected with the other two, is the area beside the new shopping centre where three residential towers are located: two of them already exist, while a third one is to be realised. Another residential tower is proposed in the design, located on the other side of the railway track next to the service flats for the elderly. A large underground parking space will be placed under the shopping centre, easily accessible from the street for car traffic.

The interventions along the Meerzichtlaan and the re-development of the central area are closely connected. Gates and openings assure a spatial continuum that is further fostered by functional continuity. In order to reinforce the connections between the two developments, and to stress the centrality of the new

Figure 6 A second neighbourhood axis will cut across the neighbourhood pleasantly accented by water.
system in relation to the neighbourhood, we propose to realise a second diagonal axis crossing the whole neighbourhood and supporting slow modes of transportation (pedestrians and cyclists). This axis will connect the park with the high-rise area, crossing the Meerszichtlaan and linking to the new system of squares created in the central area. The axis will be pleasantly accented by water.

9.3.2 The level of the district
The design interventions at the level of the district aims to introduce reference points for social and functional opportunities in the low-rise area, and to improve the quality of the physical environment in the high-rise area.

A network of small tele-centres having a supportive function for the districts will help local communities to cope with the tasks of daily life. These tele-centres will offer the opportunity to carry out domestic tele-activities, like shopping and banking, and some leisure tele-activities. Most important will be the presence of a help-desk, to ease difficulties in managing the technologies, and there will be an information system. The tele-centres will have to assume a specific social role in the low-rise area. For this reason, it will be necessary to combine the virtual services with other physical 'social' services, such as a café or other gathering places. In this view, the design of the tele-centres will be very important. The emphasis should be placed on the 'social aggregation' characteristics of the design along with the functional offering of services. For this reason the outdoor space around the tele-centres will be designed as well, looking for settings enabling the possibility of encounter between people. Sheltered seat places, groups of benches and playgrounds come readily to mind. It could be useful to introduce in the tele-centre a larger space for the performance of group activities, whether supported by telematics or not. The tele-centres are introduced in those places having an existing social relevance and where there is more space available, for instance beside primary schools. As well as domestic and leisure tele-activities, tele-centres could also host few spaces/rooms for activities requiring more privacy and concentration, for people who seldom perform these. For instance, it could be tele-work when this is occasionally performed, (and not as a regular weekly scheduled activity) or for tele-education or some particular tasks or social categories.

Besides the virtual connections, this network of tele-centres will be connected in a physical system of routes and paths. In the design, the spaces in background colour show these physical connections. They are designed taking into consideration the availability of free space especially concerning the low-rise area. The paths will be equipped with points of attraction such as kiosks, where possible, or benches and playgrounds.

Urban furniture in the form of telematics access points, similar to the present telephone booths, but making possible the accessing of the Net, will be another feature of these paths. The idea is to stress the relevance of the paths in the social economy of the districts. For this reason they will be made recognisable and attractive to people and, in the low-rise area, they will introduce an otherwise missing direction for spatial orientation. The dwellings situated along the paths will have the opportunity of being modified to make better use of the new socio-spatial situation to be created here. This will be explained in the next section that deals with the dwelling level. The union of all paths will produce a 'ring' around the central area, which will assume significance also for the higher level of intervention — the neighbourhood.

In the high-rise area the introduction of local tele-centres will be combined with other elements with the aim of improving the quality of the physical environment. These elements will be life-time dwellings, probably in
and to the availability of the necessary physical conditions.

Nevertheless, the design focuses on those dwellings having a 'strategic' position in the new socio-spatial situation that will be created by the above-mentioned interventions. In particular, the dwellings positioned along the paths described in the previous section could acquire more relevance. Indeed, since the aim is to confer more vitality and social potential to these paths, it will be useful to facilitate the introduction of productive activities especially in the dwellings lining the paths. The idea is to suggest possibilities to realise the modifications of these houses in such a way as to enrich the paths with more life, activities, and occasions for social encounter. Space can be added to the dwellings lining the paths with characteristics that make possible the performance of tele-work, or to be used as workshops and even small shops. These spaces/rooms can be thought of as separate entities from the main

**Figure 8** The built pattern in the high-rise area will be completed with a low-rise regular pattern of services and life-time dwellings.

the form of 'urban villas', and other physical services, in particular, primary schools. The idea is to realise a physical continuum to give more direction and orientation to the urban fabric. In order to realise this idea, we propose to lay under the high-rise blocks a new low-rise pattern of buildings to integrate the existing discrete pattern with a structured fabric. Paths for cyclists and for pedestrians will be placed on top of these elements, and connected with the street that limits Meerzicht at the north. This will help to complete the physical communication system for the slow transportation mode, making it easier to reach the centre of the neighbourhood using bicycles or walking instead of using cars. The system of high-rise blocks located in the east near the city-highway will be integrated by small buildings and a multi-storey residential strip incorporating life-time dwellings. This strip will act as a barrier against the fast traffic road. The designer will have the opportunity of providing a direct access to this element from that road. In this case the strip will assume more importance at higher levels, and consequently dealt with. For instance, the designer could consider realising work-places on the upper levels and dwellings in the lower levels.

**9.3.3 The dwelling level**

The interventions at the dwelling level have the aim of facilitating the adoption of home-based modalities of tele-activities for those households who choose to opt for this possibility. Therefore, all dwellings in the area could be modified according to the needs of the users

**Figure 9** The interventions at the dwelling level will be left to the private initiative of owners. Nevertheless the interventions in 'strategic' areas will be facilitated and guided as much as possible.

body of the dwelling, still holding the possibility of being physically connected to the house. Their position will not necessarily be on the ground floor, but they should maintain a clear, easy, and direct relationship to the paths. Producing a package of 'instructions' with examples, explaining the pro's and cons of possible modifications, and delivering this to the households concerned is a way of dealing with this possibility. In the high-rise area, the interventions at the level of the dwelling are considered as an opportunity for modifying
and varying the layout of high-rise blocks in order to bring contrast in their monotony. Extra spaces can be added to the facades or placed on the roofs of existing buildings, following the example of the Lucien Kroll’s Hellersdorf intervention in Berlin (Besch, 1997).

New dwellings will be realised in the neighbourhood, compensating also the loss of dwellings in the central area due to the proposed demolitions. In particular, new dwellings will be realised in the strip along the Meerzichtlaan, in the central area (two high towers),
in the high-rise area (the strip along the main traffic road to the east and several 'urban villas'), and a minor intervention in the low-rise area. These dwellings will be designed according to the information on the introduction of telematics applications that we developed in the previous chapters of this work, and according to lifetime criteria. The same criteria will have to be adopted for the eventual renovation of existing dwelling stock.

9.4 Telematics applications in the design

It will be convenient to make more explicit the ways in which telematics applications have been considered in the proposed design. This will help bring a better understanding of the basic issue of this work: the contribution of telematics applications to the design of future socio-spatial settings.

Firstly, telematics is considered as a complement to the traditional way of performing activities. Referring to the typology of effects described in Chapter Four this means that the substitution hypothesis is not considered a plausible one, at least concerning the aggregated effects. Instead, the substitution hypothesis related to individual's choices is facilitated by the introduction of places and equipment that make possible easy access to virtual spaces. This availability of possibilities also induces generation and enhancement effects. New behaviour can be originated by the confrontation between telematics modalities of performing activities and individual needs/desires. The various parts of the neighbourhood get new meanings for their social and functional life, and a different utilisation of spaces are made possible by the strategic location of telematics access points. The relationships between access points and routes of physical communication at different scales reflect the synergy between tele-communications and neighbourhood structure.

Secondly, the main characteristic of telematics is to establish new relationships between territorial scales. Services and functions, as well as social networks, are potentially rendered independently accessible by their physical location in relation to clients/people. This characteristic is reflected by the concept of the Network City described in Chapter One. In this concept, individual choices (third level) are conditioned by the availability of services and social networks (second level), and by the structure of the physical environment. Here, the accessibility of people and services is considered a more effective concept than physical vicinity. In other words, concerning telematics, the concept of vicinity can be enlarged by including virtual vicinity. This issue has been proposed in the design by considering the relevance of the various parts of Meerzicht in relation to the different scales of networks. A system of poles has been created where clusters of (tele-) activities are introduced according to the level of the network of reference. Poles created on local networks (for instance at the level of the district) have different roles, and thus offer different services, than poles belonging to city/regional networks (for instance in the central area). A twofold process of concentration and de-concentration is associated with this operation. Major poles are reinforced with the presence of the physical functions and headquarters, while the services are de-concentrated towards lower scales of the system as virtual aliases, the terminals of the networks. This combination of concentration and de-concentration also happens at local scales, where services are concentrated in poles (the tele-centres) and at the same time they are de-concentrated by introducing the home-performing option.

A third aspect to be made explicit refers to the possibility of introducing different services in residential areas. This would have been almost impossible without applications of telematics, due to the large consumption of space required by the physical services. Telematics strongly reduces the need of space for the services. Indeed, the terminals of the services are located in residential areas, as the lower elements of the service networks. Telematics does not introduce the proper service, but an alias of the service, that gives the possibility of accessing the service even if this one is located elsewhere. It is clear that this possibility requires a minimal consumption of space, and makes it possible to realise mixed socio-spatial environments in densely built existing contexts also.

Fourthly, the introduction of telematics performance places in the neighbourhood has been done according to the repertoire of spatial possibilities defined in Chapter Four. The choice of the most suitable solution has been made according to the specific socio-spatial
situations that are present in the different parts of the neighbourhood. The home-performance option is more a matter of individual choices. Nevertheless, in the design the application of this option has been facilitated for those areas where the introduction of new activities has been considered strategically relevant in order to lessen the problems detected through the survey. This is the case for the low-rise area where the proposed modifications of dwellings have been concentrated along one physical route to create that combination of streets of ‘active life’ with others having a more ‘passive’ character to which we referred in Chapter Four. This will help to match the deficiencies in the social and functional contexts that we detected. Similarly, the interventions at the scale of the dwelling in the high-rise area have been considered as an opportunity to introduce variations in the layout of blocks. The tele-centre option has been extensively applied in the design and this for a twofold reason. On the one hand, the tele-centre option is easier to apply in existing socio-spatial settings, for it does not require intervention in the single dwellings. On the other hand, the offering of services in tele-centres is a good alternative to the home-performance option, thus having the capacity of extending the potential advantages - also over those persons who choose to do not introduce telematics activities in home, whatever may be their reason for such a choice. Two types of tele-centre have been considered in the design. Referring to the distinction made in Chapter Four they are the supportive type and the multi-purpose type, which have been introduced according to their scale of reference. The supportive type is oriented towards the activities in the local context of the districts, while the multi-purpose type has a function of connection between the neighbourhood and the higher scale.

9.5 The elderly in the design

Another item that probably deserves to be made more explicit refers to the position of elderly people in the design. How will the situation of senior citizens in the Meerzicht area be improved by the proposed transformations? As already discussed in Chapter Five, this depends on the way in which the design and the introduction of telematics applications improve the potential for independent living, social participation and community care. Here, important factors are the kind of activities to be introduced by telematics, the position of these activities in the neighbourhood, and the physical structure/organisation of the area.

The kind of tele-activities and their effects on the three dimensions mentioned earlier, this has been described in Chapter Five while the survey described in Chapter Six reported the specific applications that the sample interviewed considered to be more relevant. In particular, the design of the activities has to respond to the five ‘a’ factors mentioned in Chapter Five: availability, accessibility, affordability, awareness, and appropriateness.

Most of the tele-activities have been introduced in the supportive tele-centres, thus being easily accessible for the elderly. The vicinity between elderly people and the aliases of physical services, the virtual services, is a central element in the design. This vicinity is especially meant for the benefit of elderly people, particularly those having a limited physical range. Moreover, the tele-centres have stronger social characteristics than other options and this is a property that is especially valuable in old age. The technical staff that will be available in the tele-centre will also lessen the problems experienced by many elderly people in dealing with technology. At the same time the tele-centre will assume an important educational function: seniors will have the chance to learn the basic features of telematics and will discover opportunities and constraints related to this technology.

The tele-centres have been associated with physical routes and paths. This synergy between the ‘doors’ to virtual spaces and the physical places aims to generate zones of action in the neighbourhood, which facilitate sociality and exchange among people. The renewed socio-spatial structure that has been obtained favours the integration of elderly people in the context, for seniors are very sensitive to the social qualities of the environment. The information described in Chapters Two, Five and Six makes evident this relationship between social characteristics and quality of life in old age. In particular, the combination of the feeling of social dissatisfaction detected in the survey with the social trends associated to the introduction of telematics may produce a difficult situation for elderly people. One of the primary intentions of the design is to create a socio-spatial setting able to cope with this risk.
Another item to be stressed is the application of the 'design for all' concept in the design. This has been done at different scales. Hindrances and obstacles limiting the daily behaviour of elderly people have been eliminated as far as possible. The Meerzichtlaan has been downgraded to a two-lane road where traffic-calming solutions are applied. In this way the Meerzichtlaan looses the concept as a barrier that is presently experienced by senior residents. The new dwellings will be designed according to lifetime criteria. The re-designed railway station is made safer and more easily accessible. The upper square above the new shopping centre can also serve this role. Design for all should also refer to the design of the technology. The five 'a' factors mentioned earlier are important in this concern. Moreover, the help-desks in the tele-centres also have a function of mediation between people and functions. Finally, the presence of services at a short distance from the home of the elderly people introduces the possibility of choosing the preferred modality of performance in relation to the situation of the specific moment.

9.6 Feasibility

A last item related to the proposed design for Meerzicht to be considered shortly refers to its actual feasibility. Discussing how far the design is technically, socially and economically feasible can serve this goal.

The technology needed to make the design feasible as a project is already available in large part. Developments in ICT have produced applications in almost every relevant field of urban settings, both in service engineering and in communication for social purposes. Nevertheless, much can still be done to improve existing possibilities and to design new services. In our opinion, improvements are needed especially in the fields of health care and education where there is room for the development of new applications of telematics. The information gathered, and the knowledge developed in this work expressing the point of view of the urban planner will be useful towards the goal of the development of new services and applications. However, it must be commented that the modalities of introduction of telematics applications that have been proposed for Meerzicht depend on the hypothesis of re-organisation of the functional and social environment described in Chapter Two. Current trends show that the re-organisations foreseen will very probably be transformed in reality, but this is still an on-going process that needs to be further directed. The introduction of telematics applications in not simply a matter of introducing computers and modems, but is a step within a more general process of re-organisation of socio-spatial components.

The proposed design is also socially feasible for it is directed towards the goal of the improvement of the quality of life in the neighbourhood, especially for senior citizens. The philosophy that has been adopted is 'matching needs and realising opportunities'. Attention has been given to a twofold order of items. On the one hand, the introduction of telematics applications and the proposed modifications in the structure of the neighbourhood responds to the problems detected with the survey and to more general characteristics of living in old age (see Chapter Five). On the other hand, these elements have been introduced in such a way that they facilitate the performance of desired behaviour by elderly people. The accessibility of services of education, for instance, is not a specific 'need' of life in old age, but can improve the quality of life by introducing the possibility for seniors to 'realise opportunities'. The presence of help-desks in tele-centres lessens the barriers caused by the scarce technological literacy among seniors. This approach is able to diminish the risks of polarising the elderly of the neighbourhood in relation to the developments of technology and its effects on the socio-spatial dimensions of cities that have been discussed in Chapters One and Two.

The economical feasibility of the design depends on how the proposed interventions may produce benefits of economical nature. Are there economic advantages produced by this re-organisation? The clearing of a number of residential buildings in the centre of the neighbourhood and their re-edification in other places is a costly operation that can be economically justified when these interventions create a better market. Additionally, is there a developed market for tele-work places? Who is going to pay for the realisation of tele-centres and the offering of services? These questions are important, but they do not yet have a certain answer. Indeed, as remarked earlier in discussing technological feasibility, the re-organisation of the different
components of urban settings is still a trend more than a reality. The design project is future-oriented, thus it believes that the markets for telematics applications and associated spaces will develop in the future. However, we also believe that at an early stage the introduction of telematics applications needs the active participation of the State, not only by supplying incentives of any nature to private bodies, but also by introducing services of public utility that are accessible to all social categories (e.g. education, health care). In substance, it is important that in the early phase of development of telematics services the State assumes a steering function to permit the rise of a healthy market. As soon as the standards are established suitably, then the State will gradually withdraw to assume the position of the controller. Nevertheless, even if the economical advantages of the suggested re-design are doubtful, the associated social costs are to be considered positive.

Notes

1. Some primary schools in the low-rise area were redundant and have been demolished. This makes space available for introducing tele-centres.
2. We propose demolishing the existing primary schools in this area to better re-organise the physical structure.
3. About synergy, substitution, generation, and enhancement effects.
4. It could be useful to stress again that the concept of Network City should be considered mainly as a strategy of territorial organisation rather than as an urban theory.
5. Telematics and social items.
6. Focusing on the elderly.
7. The Meerzicht survey.
10. Conclusions
10.1 Introduction

This work explored a specific research area within the domain of city-telecommunications relationships. The design aspects related to the introduction of telematics applications have been researched within the spatial reference framework of the Network City (Dupuy, 1991; Drewe, 1996). Up to now, urban observers and social scientists have produced the available knowledge in the field of city-telecommunications relationships (e.g. Webber, 1964; Castells, 1989; Graham & Marvin, 1996). Also the little available information on the layout and spatial organisation of architectural and urban settings is mainly the product of the interest of social scientists (Ahrentzen, 1987; Moran, 1992). Knowledge directly produced by designers is scarce and mostly intuitive (Eleb-Vidal et al., 1988; Mitchell, 1995), although some attempts can be recognised of a more systematic approach to design items (Beguinot & Cardarelli eds., 1992; Caso & Tacken, 1993). In latter years, the design aspects of city-telecommunications relationships are beginning to raise interest among designers. This is partly due to the fact that cities started to introduce telecommunications in their development programmes and strategies (e.g. teleports, digital cities, living/working environments). The Dutch Ministry of Spatial Planning, Housing and Environment (VROM) shows an example of this interest towards potentialities and risks related to ICT applications in cities and regions (Drewe, 1996; 1998b). This rising interest along with observation of the present situation led us to the following problem statement.

Current practice in urban and architectural design does not take into proper account possibilities and risks for the potential modification of socio-spatial settings in relation to the ongoing spreading of ICT. Potentialities and risks are more often spoken about than designed. The main reason for this lies in the scarcity of available knowledge for designers and urban planners.

We have addressed this problem by pursuing a two-fold goal.

— Identifying a number of qualitative guidelines able to lead the designer throughout the design process at different scales, with specific attention to the residential environment.

— Giving insight into the role of ICT applications for the improvement of quality of life in old age and applying the knowledge produced to a specific case study.

The first part of this work (Chapters One to Four) dealt with the first of the above-mentioned goals, while the second goal has been the focus of the second part (Chapters Five to Nine). These goals have been reached by giving answers to the seven research questions posed in Chapter One. These questions concern the social and cultural aspects of city-telecommunications relationships; the trends towards re-organisation of the functional environment; the time-space effects of teleactivities; the design issues at different scales; tele-applications for the elderly; relevant design aspects of telematics in ageing society, and the design of a neighbourhood of the network city. Four research questions belong to the first part, the remaining three to the second part. This chapter describes the main results of the research, by summarising the answers to the research questions.

10.2 Knowledge development and theory

Commentators agree that 'city-telecommunications relationships' is a very underdeveloped field in urban studies (Graham & Marvin, 1996). Ironically, this strongly contrasts with both fears and expectations regarding a future dominated by virtual networks (Toffler, 1981; Virilio, 1993). Nevertheless, the knowledge already developed by observers and social scientists, although fragmented and contradictory, is the only knowledge to which designers can presently refer. Therefore, it is from here that any investigation on the design significance of telematics must begin. The central methodological problem of this operation concerns the building of a bridge between research and design. The first part of this work has been primarily concerned with the building of such a bridge.

Taking into consideration the SCOT / PEST approach we proposed to translate existing knowledge into design knowledge by following a number of sequential steps. This process is represented in Chapter One by the scheme From Telematics Innovation to Design.
1. Investigation of the actual trends towards the re-organisation of the functional and social environments of urban settings. Information and interpretations concerning these items are the product of the work of observers and social scientists. This is the knowledge presently available.

2. Identification of tele-activities. People interact with social and functional environments by carrying out activities. Telematics introduces new ways of carrying out activities. These we call tele-activities.

3. Investigation of time/space properties of tele-activities. To understand the meaning of tele-activities for the behaviour of people we need to explore the related time-space aspects. What the performance of tele-activities actually means for individual behaviour in time and space.

4. Design issues related to tele-activities. Deriving from properties of tele-activities for people (time-space, privacy, concentration) qualitative suggestions are proposed regarding the position and structure of 'performing places' of single tele-activity in residential environment.

5. Aggregated design aspects at different scales. The integration of different tele-activities in poles is a matter of compatibility among tele-activities and between tele-activities and more traditional activities. Additionally, different organisational possibilities concerning the relation between the physical structure of urban settings and the accessibility of services should be considered.

These steps are closely tied up with the structure of the Network City model discussed in Chapter One (Dupuy, 1991). This model is formed by the convergence of three non-hierarchical levels. The first level is the level of the physical environment. The second level includes the operators of social and functional networks. Individuals in their daily life behaviour form networks at the third level. The operation described in step one refers to the
intervention of telematics applications at the second level of the network city model. Here, the relationship between second and third level can be described in terms of activities rendered possible (step two). The changing time-space behaviour of people when performing tele-activities belongs to the third level of the model. This is investigated in step three. Relations of reciprocal influence exist between the three levels of the network city model. The re-organisation of social and functional environment on the one hand, and the changing individual behaviour due to the use of tele-activities on the other influences the programmes on which built environments are targeted. We carried out this operation in steps four and five.

The above mentioned steps permitted us to reach the proposed goal of part one. This was done by answering four research questions. These answers are summarised below.

1 What are the most relevant social and cultural aspects of the introduction of telematics applications in contemporary socio-spatial settings?

Information gathered and discussed on this item shows the existence of two schools of thought. On the one hand it is argued that telematics applications are an emancipating tool for many disadvantaged social categories. They will contribute to the rise of a new, freer social order where the empowering and harmonising characteristics of telematics will bring a healthy mix of diversity, pluralism and variety (e.g. Negroponte, 1995). On the other hand, many observers stress the alienating and disorientating effects of telematics, the difficulty of distinguishing what is real from what is virtual and the loss of reference points in an ever-changing environment (e.g. Virilio, 1987). Observation of current dynamics seems to give more credit to this second view. Present developments are producing more inequality instead of filling existing social, cultural, and economic gaps between social groups (e.g. Stoll, 1995; Graham & Marvin, 1996). At the same time, the possibility of a better future is not denied even by the most pessimistic. There is potential for contrasting the current trend towards socio-spatial polarisation by implementing measures able to assure a better accessibility to virtual spaces and to improve electronic literacy.

The social and cultural aspects of telecommunications in cities have been investigated according to five key-areas as proposed by Graham & Marvin (1996): post-modernism and urban culture; social inequality and polarisation; the household as a locus of urban social life; the development of telematics-based social surveillance and the emergence of virtual communities based on telematics networks. Some elements in these five key-areas are particularly relevant for the designers.

Present trends towards socio-spatial polarisation in cities need to be carefully considered. These trends put at the centre of the debate the situation of less favoured social categories in future cities. While the most well-off and highly educated people will be able to enjoy the advantages offered by telematics applications, the risk exists for other categories to be trapped in what Graham & Marvin (1996) call 'information ghettos'. It is important to develop specific policies to extend the benefits of telematics to all sectors of population, and their correct implementation cannot avoid considering the contribution of urban planning. It is not only a matter of incentives and educational programmes, but also of the design of virtual services and of organisation of urban settings (e.g. the position of facilities). The potentialities and risks for less favoured groups of introducing telematics applications deserve particular attention. In the second part of this work we have investigated in greater detail the situation of senior citizens, a less favoured group that could have much to gain from a correct introduction of telematics.

The trends towards socio-spatial polarisation in cities parallel the trends towards home-centred life. Homes and residential neighbourhoods seem to acquire added importance for people (Ahrentzen, 1987; Moran, 1992; Reisen, 1997) not only as 'refuge' from the bewildering outer world, but also as the centre of their daily behaviour. Residential areas are increasingly perceived as places of production alongside their more traditional role as places of consumption. It has been argued that this trend is a direct consequence of progresses in telecommunications that render it possible to perform many tasks from residential areas. As an alternative, we have proposed a different interpretation (in line with Moran, 1992) stressing the role of telecommunications as answer to difficulties to relate to the context. Fear of crime in streets, a changing labour market and the need
of self-recognition. Pursuing home-centred life-styles is a matter of choice, and it is clear that this choice can be exercised by those who have knowledge of telematics and the way to take advantage of it. For others this possibility to choose is more imaginary than a real option. This connection between on-going polarisation and home-centred life also serves to explain the rise of the phenomenon of 'fortified neighbourhoods' or 'gated community', by which members of the higher class establish clear separation from the surrounding context, supposedly aggressive. Organisation of urban areas can play an important role here, by rendering the making of choices a real opportunity for all groups.

Choice is the third element of the social aspects of city-telecommunication relationships that we want to underline here. Storgaard & Jensen (1991) remarked that with telematics it becomes easier to associate with those sharing one's interest instead of one's location. Social relationships can be re-organised at different scales according to criteria other than physical vicinity. Obviously, this possibility does not imply that physical social communities become superfluous. It tells us that different ways can be used to form social networks, and that now we have more possibilities to choose the combination most suited to our social needs.

In conclusion, considering the social and cultural aspects of city-telecommunication relationships, two apparently opposing mechanisms become convergent for people. On the one hand it is possible for people to emancipate from the local situations to merge into the global of media supported virtual networks. For different motivations and with different modalities, people accessing the Net can give form to their own social networks, either through fixed relationships or more flexible ones. On the other hand, these disembodying processes feed back into a different and maybe more intense experience of the tangible, immediate domain of individuals. Virtual social communities complement physical social communities contributing to the satisfaction of those social needs that are missing in physical communities. In turn, physical communities acquire more value for individuals as 'social anchors' to reality.

The building of virtual social networks becomes a reality by using a number of tele-activities to support remote interpersonal communication. Although any (tele-) activity has a social valence besides the functional one, in this part of the research we have identified those tele-activities having a stronger capacity for social relationships. Telephony remains by far the most used activity in this field, but computer-mediated communication increasingly offers multiple opportunities to get in touch with others. Among these we can mention Video-telephony, E-mail, Instant Messaging Systems, Chat Lines and Computer Supported Discussion Groups. These systems make possible alternative ways for individuals to access social environments. In other words, they are alternatives to link the second level of the network city model with the third one. The decision about which system or combination to employ to reach social tasks becomes a matter of choice more than ever before, and the choice will depend upon specific situations and upon the nature of the task.

2 How will the functional system of the modern city change under the pressure of possibilities offered by ICT?

We have answered to this question by making an exploration into trends of re-organisation of urban functions. A list of twenty urban functions – (subdivided into living and working, supportive functions, and transportation) – has been reviewed systematically and the elements for their re-organisation related to the possibilities introduced by telematics have been pointed out.

All in all, a twofold process has been detected. On the one hand, services and functions once considered as a necessary unit can be now separated into functional units and eventually spread in space. This process applies especially to the location of information in relation to the proper service, and to the physical realisation of products in relation to their design. Thanks to telecommunications these units still work as a single body. On the other hand, most functions and services can be remotely accessed by users/clients. This requires the development of more or less automated 'on-line' services with all the related consequences such as the protection of privacy, the legality of operations and the degree of interactivity of the whole system.

The introduction of telematics applications in the functional environment of the modern city is leading
towards a re-organisation of the urban functions according to networking modalities. This happens at two levels. One level concerns the single functions that assume the form of networks, with headquarters, sub-centres/branch offices, remote producers of services and clients/consumers. The other level concerns the integration of functions. Functions have interest in dialoguing between themselves to produce better services, making use of each other’s expertise, diminishing expenses and controlling the market. They use telecommunications to make this dialogue possible and efficient. An example here is the relationships between production and the shopping and banking sectors.

These networks are interesting to the designer because they suggest the possibility of alternative organisations for the ‘software’ of the city, the second level of the Network city model. If urban functions and services are increasingly assuming network forms, the designer should be concerned with the access points to the system. This involves the overall organisation of urban areas (e.g. the location of access points) and the design of the same access points. These are clearly design problems that concern different territorial scales.

An overall conclusion for this research answer is that current trends of re-organisation of urban functions and services in socio-spatial settings are introducing more possibilities of choice for both clients and service providers. Users have the possibility of choosing the modality to employ to reach a specific functional task, whether to go to the physical centre or access it virtually by using aliases of the proper services. Service providers can choose from different possibilities to give form to their organisations, whether to concentrate services in a physical place and diffuse aliases or to divide the function into parts and spread it throughout the whole urban area. For both the decision depends on specific situations like the nature of the task/service and the socio-spatial properties of the urban environment. Individual behaviour, the third level of the network city model, gets more freedom in making use of urban services of the second level, but this freedom depends upon the organisation of the functions and upon the location/design of access points to the system.

3 What are the most significant time-space consequences of the use of telematics applications by people and public and private institutions?

The systematic exploration of trends of re-organisation of urban functions reported above and the investigation about the changing social system in the modern city have pointed up a list of tele-activities made possible by employing telematics applications to reach tasks of a functional and social nature. These tele-activities are the link between the second and the third level of the network city model. People and institutions get in touch with services and with other people by performing activities. The characteristics of these activities are determinant for the understanding of the possible behaviour of people and for the design of access points.

We have investigated this item by distinguishing tele-activities according to their function for the household. Four groups were identified: productive activities, domestic activities, supportive activities and leisure and recreational activities. To these a fifth group was added, generically called ‘other tele-activities’ because of their supporting function for (tele-) activities in all mentioned groups. On the basis of this distinction, the time-space significance of tele-activities has been systematically investigated. To get more specific information on the time-space effects of tele-activities in residential areas, we decided to use more specific parameters than time and space. Time was considered in terms of frequency, moment, and duration, while space was considered in terms of diffusion, location, and consumption (Beckers & Raaijmakers, 1991).

The parameters chosen for the investigation are useful to designers because they give necessary information for deciding how to approach the (re-) design of residential areas according to the specific situation and to the goals of the intervention. Indeed, the tele-activities taken into consideration revealed a variety of time-space features, from which it is not possible to extrapolate a simple ready-to-apply formula. Nevertheless, some items were clarified. For instance, it was clear that the higher space consumption would be produced by the introduction of tele-work, while for other activities it will depend on the scale of the activity or be a matter of re-organisation of existing settings. The items discussed concerning location made evident two possibilities for the introduction of tele-activities: homes of people
concerned or a type of service centre. This decision depends upon many factors among which personal choices of people and frequency of performing. The moment of performing and the duration of the activity are relevant for the combination of tele-activities in space, potentially leading to different interpretations about the location of access points.

4 What are the main implications for the design of socio-spatial settings due to the changing social and functional environments of cities after the introduction of telematics?

This question has been answered in Chapter Four. Firstly, we have considered the tele-activities separately then we have tried to describe the possible design aspects at aggregated level by considering different scales of design.

From the information discussed in Chapters Two and Three, it was clear that it would not have been possible to give simple prescriptions about the design consequences of telematics applications in residential areas. The relationships between urban settings and telecommunications are too complex and contradictory to afford simple generalisations. There are different items and possibilities to take into consideration and to be evaluated in relation to the specific situations. Where possible, we decided to present a repertory of qualitative suggestions from which the designer could choose the proper one for the specific task. To carry out this operation, we have been primarily concerned with the question "what does it actually mean in terms of space to perform these tele-activities in residential areas?"

This item has been dealt with by discussing the possible locations of 'telematics performing points' in dwellings and in public environment, and the possible forms that these performing points could assume. For example, particularly interesting are the possible solutions proposed for the introduction of tele-work in residential areas. Tele-work is the most space-consuming tele-activity and its introduction needs of specific characteristics. In a dwelling environment these are the clear separation from the domestic part of the house, the maintenance of a uniform design, the easy accessibility from the outdoors, the relation with the public environment and the relation between work-related visitors and domestic environment as well as the reverse situation. The separation between work and living spheres in homes also concerns the virtual space: it is better to have separate telephone lines for the different tasks of living and working. For what concerns the location of tele-work places in residential areas, several variants have been pointed out with pro and contra: different solutions at the home level, cluster of tele-work places shared by a small number of dwellings, three types of telecentres.

This information will be useful for designers engaged in the planning of residential areas in the future. At the aggregate level, we have described possible interpretations with the help of a number of examples. We considered different scales: the scale of the region and the urban area, the scale of the neighbourhood, the scale of the dwelling, the scale of the furniture. For instance, at the level of the neighbourhood two main approaches have been pointed out. The concentration of activities and services in a tele-centre that becomes the principal place of attraction for the inhabitants of the neighbourhood, and the introduction of tele-activities and services in the dwellings of people. In this case the residential street gains importance as a design theme. More specific information has been given regarding the design of neighbourhood tele-centres and dwellings. Important items to be considered here are the compatibility in time and space between activities, and the relationships between activities and the outdoors in terms of physical accessibility.

An overall conclusion for this question is the confirmation of the 'multiple choice' situation that designers face when they deal with the design of socio-spatial settings introducing telematics. This 'multiple choice' effect affects both designers and users of the settings. The multiple choice is not an absolutely new situation for urban design, but it assumes more weight due to the possibilities offered by telematics. The main task of designers is to make choices in the situations where telematics has to be employed to reach goals of spatial planning and to introduce mechanisms to facilitate the making of choices for the inhabitants of the settings they design.

10.3 Case study specification

The first part of this work has been devoted to the building of a bridge between available research on
city/telecommunications relationships and design aspects of telematics. Following a number of steps in the framework of the Network city model, we have developed an extensive knowledge of the phenomena at issue. We have concluded this part by presenting design suggestions for the introduction of telematics applications in residential areas. These suggestions cover a broad range of possibilities. The choice of the proper solution depends upon the specific socio-spatial situations in which designers operate.

The second part aimed to particularise the developed knowledge to a specific socio-spatial case. We decided to focus on the social group of elderly people and to observe their situation in a real context. We conducted a field investigation in the residential neighbourhood Meerzicht in Zoetermeer. The detected items served as basis for the re-design of the area as a neighbourhood of the Network city where telematics applications are introduced for the benefit of senior citizens.

The choice of elderly people as target group for the second part of the investigation is significant. Indeed, elderly people are a less favoured social group that is in danger of being excluded by the advantages of the ‘information society’. At the same time, the time-space properties of telematics are well suited to contribute to lessening many problems of life in old age. Therefore elderly people form a symbolic group for investigating the potentialities and risks of telematics applications and for exploring the possibilities of design in this concern.

The goals of the second part have been reached by answering three specific research questions.

5 Which telematics applications can play a significant role in improving the quality of life in old age, and what are the associated risks?

Elderly people do not form an homogeneous social group. The only distinction refers to age limits above which a person is considered senior. Very often this limit coincides with the retirement age (ca. 65). Notwithstanding this heterogeneity there are issues that are common items in old age. They mainly refer to the slowing down of bodily functions and mental capabilities that influence many sides of life in old age, from proper health issues to items of security and safety, from the ability to perform Activities of Daily Living (ADLs) to participation in social events and leisure activities. Telematics can be an important support for elderly people experiencing problems as well as a tool to realise desired behaviour. We have investigated the relevance of telematics in matching problems and realising opportunities in relations to three key-factors.

— Independence or self-determination. The degree to which the elderly are able to dictate the path that their lives should take (Fisk, 1986).

— Social participation. The capacity of the elderly to take part in social events or activities. This largely depends on the ability to overcome contextual barriers (Tacken, 1993).

— Community care. The degree to which a given community is able to supply (informal) care to the elderly person who need it. Quality of life in old age is deeply influenced by supporting networks of a social nature (Cullen & Moran, 1992; Knipscheer et al., 1995).

Many telematics applications can improve the ability of aged people to live with independent life-styles. Tele-health care and tele-medicine, in their many variants, can reduce the importance of early physical and cognitive limitations. Tele-shopping and tele-banking are useful to match the problems that may emerge in the traditional performance of the associated tasks: carrying heavy bags, mobility constraints, the ‘full wallet’ danger. At the same time tele-applications can be usefully employed to facilitate access to services that can be the target of desired behaviour: education, leisure time activities, and library.

The participation of elderly people in social life is an indicator of their quality of life. Telematics makes easier the access to information and the planning of routes facilitating the performing of outdoors social activities. Security on streets can be improved by tele-surveillance. Especially for the less mobile, occasions of social exchange are increased by a variety of applications such as video-telephony, chat-lines, and instant messaging systems. These applications facilitate the link of the less mobile elderly to the social context helping them to remain aware of happenings and social standards.
Technology should be designed to help the caregiver as well. The community care context can employ telematics applications to supply more effective and efficacious assistance to the elderly persons that need it. Knowledge and expertise become more easily accessible. Remote monitoring systems and smart home technologies can be combined in the task of assisting the elderly. By this means, the risk of domestic accidents can be reduced and this can enhance the possibility of informal care by relatives and friends.

These aspects can exert a positive influence on the quality of life of older individuals, but this is subject to conditions. Indeed, there are also relevant risks that have to be considered. These risks are related to the design of services and equipment and to the layout of 'performing places'. An incorrect introduction of telematics applications may threaten the positive potentialities and increase the risks. Following the example of PROMISE (1998) we have described five 'a' factors for a correct introduction of telematics applications for the benefit of all categories, thus including the elderly. They are: availability, accessibility, affordability, awareness and appropriateness. In particular, the lack of resources, either economic resources or skill resources, can become an impediment to the advantages of telematics. Another factor to take into consideration is the risk of increasing isolation for those elderly people experiencing problems of constrained mobility or declining mental capabilities since they could be as well remotely assisted thanks to applications of telematics.

6 Which design aspects will gain importance in relation to the introduction of telematics applications for the benefit of seniors?

Besides the design of equipment and services, the location and layout of performing places in relation to elderly people is very important.

The proximity amongst elderly people and access points to the virtual networks is a relevant aspect for the design of urban settings when telematics is introduced. This gives alternatives to the home-performing option that are as well practicable for people with constrained mobility.

The tele-centre seems to be the most suitable option for the characteristics of the social group of elderly people, and for differing reasons. Firstly, recalling the five 'a' factors mentioned earlier, the availability of technical personnel and of a help-desk contributes to lessening the difficulties of the relationship between people and technology. The elderly person is not left alone against this, for a large part unknown, virtual world, but can be supported and guided towards the goals (s)he wants to reach. Secondly, the tele-centre can deliver an educational function for the elderly. It will be easier to learn how to achieve goals and to use the equipment in collaboration with other people, either young or old. Thirdly, the tele-centre has a stronger social character than the other solutions. Being an attraction point for many persons it also turns out to be a place of social encounter and exchange amongst inhabitants of the residential area. This characteristic should be reinforced by the layout of the centre by providing facilities that make it easier to perform social activities both indoor and outdoor, such as cafés, benches, play-grounds and so on.

Older inhabitants particularly appreciate the social characteristics of an environment. It is important to design socially-sound settings to assure this property. If the tele-centre can act as a social catalyst, it is important to design public spaces as well for these purposes of social life. A clear hierarchy of residential streets should be pursued, to distinguish streets and places of action from quieter environments. If more tele-centres are introduced in an area, it will be useful to link them in a physical network of routes equipped with facilities for social encounter.

Another design item to be considered in the design of urban settings for elderly people concerns security in the public environment. As well as more traditional systems to facilitate social control, applications of telematics like tele-surveillance can be also considered to discourage crime in the street. The risk of introducing these systems is that they can be perceived as a threat to individual privacy. Therefore, it will be better to apply these systems only to some parts of the setting and not to the whole area. Mobile telecommunication systems like the cellular phone can also be relevant for improving the feeling of safety in public environment. Using these systems the person may require the help of others in case of need, and the choice remains with him/her.
A last item concerns the concept of 'design for all'. For telematics applications this mainly means considering the five 'a' factors mentioned earlier. Concerning the physical environment like the design of 'access points' a layout specifically targeted on elderly people should be avoided, otherwise the risk of targetisation for users could produce negative consequences. The other points mentioned above go in the direction of a 'design for all' approach.

7 What is a possible design for a residential neighbourhood of the Network City?

This question has been answered in Chapter Seven (The Programme) and Chapter Nine (The Design). Deriving from the findings of the previous parts of the research we have proposed a possible interpretation of a neighbourhood of the Network City. In particular, the items of designing for the ageing society described in the answers to the previous two questions, the findings of the survey included in Chapter Six, and the repertory of possible solutions developed in the first part of the research have supplied the necessary information for the development of the design. The area of Meerzicht in Zoetermeer has been re-designed as a mixed socio-spatial environment where virtual services are introduced at different scales for the benefit of senior citizens. This design served two goals.

— That it is possible to make a research design and to produce a realistic design based upon the results of the survey and upon the knowledge we developed concerning the design aspects of city/telecommunications relationships.
— To check whether the developed knowledge contained the necessary tools to make a design. It served to control the validity of the theoretical assumptions made in the first part of this work.

The proposed design is in the firstly the re-design of the relationships between the different parts of the neighbourhood. In particular, it concerns the routes of physical communication and the different scales of intervention, and the position and significance of telematics access points in relations to routes and scales. Three scales have been considered:

— The neighbourhood as a whole and its potential role within territorial networks at city/regional level.
— The districts as basic units within local networks.
— The dwelling as departure and arrival point for the daily socio-spatial behaviour of people.

The leading concept in the design is the value of the intersections of networks at different territorial scales. Poles have been created on these networks where tele-activities have been introduced according to the value of the intersections. The poles located on the higher networks have a meaning at city/regional level for their easy physical accessibility. Here we concentrated services and activities able to attract people from the whole neighbourhood and from the urban area. Poles located on local networks host services and activities having a supportive function for local communities.

The poles introduced on the different territorial networks have been connected between them by physical networks of routes and paths as well. This structure reflects the synergy between virtual spaces and physical places. This synergy is an important condition to effectively introduce telematics applications in the area. The access points are considered as 'doors' to the virtual networks, and these doors are located along main routes in physical places. In turn, the paths connecting the poles acquire more significance because of the movement of people originated by the presence of the poles. Here we can have both the effects of generation (new behaviours) and enhancement (improving efficiency and capacity) due to the presence of the alternatives introduced by telematics.

10.4 Main conclusions

The relationships between city and telecommunications are complex and contradictory. The issues presented in this work confirm this complexity. Indeed, telecommunications support almost all the tasks of human life, and can be used to reach tasks of a different nature and often of a contrasting direction. When we analyse the associated design items these characteristics become even more striking. It is not possible to find any direct and unequivocal connection between telecommunications, social and political dynamics and specific design solutions for urban settings. Nevertheless, a repertory of suggestions has been developed that can be applied in different spatial
situations. We have chosen the Network City as the spatial reference because we believe that this model is better suited to exploit the potential of telematics.

It seems clear that the design aspects of city-telecommunications relationships are better investigated within the SCOT / PEST approach. This permits taking into consideration applications of telematics that are relevant for society and considering the diversity of uses of applications according to different needs. From this work it emerges quite clearly that the research of the design aspects of city-telecommunications relationships is a concrete field of study and that interesting results are possible in this field when the investigation starts from social and functional dynamics.

The introduction of telematics applications, and thus the associated design items of the connections between virtual spaces and physical places, adds other possibilities for the design of urban settings. Alternatives that were not practicable in a world dominated by physical communication become feasible when virtual connections are associated with the physical modalities. For instance, the logic of radial extensions of urban areas from the centre towards suburbs according to the concept of vicinity between people and functions can be integrated by the logic of extensions in nuclei, islands clearly separated from the main urban area that hold connections of both the virtual and physical types with the other centres.

We have seen that with the contribution of telematics more choice comes about concerning the relationships between the third level of the network city model (the individual in his/her daily behaviour) and the second one (the social and functional networks). Individuals may enjoy more alternatives to perform functional tasks and to come in touch with other people. The designer should take this ‘multiple choice’ as a basic input, trying to design settings in which choice is an effective opportunity. But, this depends also upon the trends towards re-organisation of social and functional environments. The introduction in residential areas of virtual aliases of services and functions can be done only if these services and functions are re-organised in network forms. Two main conclusions can be extrapolated from here. On the one hand, design assumes the function of ‘choices organiser’ more than before. This happens both at the level of making possible multiple options for individual behaviour and at the level of deciding which combination among the many made available by telematics to introduce into the design. On the other hand, it is important to develop new methods of collaborative design, in which different figures bring their expertise for a more efficient organisation of urban settings.

Another conclusion refers to the growing importance of the social dimension for future settings. We have noticed this aspect by analysing the situation of elderly people, but there is little doubt that the quality of social relationships assumes greater importance in residential areas after the introduction of telematics. This conclusion is supported by empirical evidence quoted in various parts of this work (e.g. Ahrentzen, 1987; Moran, 1992; Reisen, 1997) and by our own conclusions regarding the relationships between social virtual networks and social physical networks. Here we stated that merging in the global virtual environment of media-supported communication is balanced by a more intense experience of the immediate surrounding of individuals. If virtual space permits us to reach the most remote places of the globe, although virtually, the quality of the ‘doors’ to virtual spaces (the physical places from where to access the Net) assumes added importance for people.

The introduction of telematics applications is often considered to have revolutionary effects on the various components of urban settings. This work made clear that no revolutions will happen. It will be more a matter of evolution, where the organisation of urban settings will find the way to adapt to new situations while also respecting the legacy of previous historical periods. This evolution can be partly designed, and this work gave suggestions on how to do it correctly in order to exploit the positive opportunities enabled by telematics.

10.5 Directions for future research

The previous section has already anticipated some important directions for future research in this field.

The role of ‘choice organiser’ that the design is increasingly assuming can be the object of more
detailed research. What are the mechanisms behind the making of choices by designers and people? How do we develop a systematic decision support system to orient the choices of the designer within the many possible variants introduced by telematics applications? We have given some indications about these items, but more research is needed.

Management of collaborative design, from political and economic choices to the development of specific services and their application in design, needs more attention in relation to the possibilities introduced by telematics. The development of services and the reorganisation of the functional environment are still ongoing processes. The involvement of urban designers from the beginning of these processes is necessary to develop services that are relevant for tasks of spatial planning. More detailed research is needed.

In particular, deriving from the previous point, research is urgently needed especially in the fields of commerce, health care and education. Projects and experiments are presently being conducted, but they rarely involve spatial planners. It is important to set up more collaborative and multi-disciplinary research projects.

The research developed in this work can be considered in itself as a starting point towards more research upon the design aspects of city-telecommunications relationships. For instance, the knowledge developed in Chapter Four can be integrated with new suggestions and solutions having more insight especially on single tele-activities. It will be extremely useful to start to identify test-beds to realise experiments to be evaluated in their real life aspects. This is the next step in the direction of a better understanding of design aspects associated to telecommunications.

Notes

1. See for instance the Design Studio 'The Netwerk Stad VROM'.
2. This approach has been described in Chapter One. The SCOT (Social Construction of Technology) argues that social and political items by individuals and organisations shape the development and use of telematics applications. In turn these applications have effects on cities. PEST stands for Political, Economic, Social, and Technological factors.
Samenvatting: De stad, de ouderen en telematica

Ontwerpaspecten van telematicatoepassingen in een woonbuurt.

Deze studie onderzocht een specifiek domein in de relaties stad en telecommunicatie. De ontwerpaspecten die voortkomen uit de invoering van telematicatoepassingen worden onderzocht in het kader van de Netwerkstad3 (Dupuy, 1991; Drewe, 1996), (figuur 1.)

![Figuur 1](image)

Tot nu toe, produceerden stadsontwerpers en sociale wetenschappers de beschikbare kennis over de relaties stad - telecommunicatie (e.g. Webber, 1964; Castells, 1983; Graham & Marvin, 1996). Ook de beperkte kennis over de planvorming en de ruimtelijke organisatie van architectonische en stedelijke projecten is voor het resultaat van de belangstelling van sociale wetenschappers (Ahrentzen, 1987; Moran, 1992). Kennis die door ontwerpers is ingebracht is beperkt en meestal intuitief (Eleb-Vidal et al., 1988; Mitchell, 1995), hoewel sommige pogingen kunnen worden herkend als een min of meer systematische aanpak gericht op ontwerpen (Beguinot & Cardarelli, 1992; Caso & Tacken, 1993). In de afgelopen jaren is de belangstelling voor ontwerpaspecten van de relatie stad - telecommunicatie onder wetenschappers toegenomen. Dit is deels te danken aan het feit dat overheden starten met de invoering van telecommunicatie in hun ontwikkelingsprogramma’s (e.g. teleports, digital cities, woon- en werksituaties). Het Nederlandse Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu (VROM) laat een voorbeeld zien van deze belangstelling voor de mogelijkheden en risico’s van Telematicatoepassingen in steden en regio’s² (Drewe, 1996). Tegelijkertijd vertegenwoordigen de bestaande modaliteiten van de invoering van telematicdiensten een risico voor minder bedeelde groepen, die naast de potentiële voordelen blijven. De positie van de groep ouderen is kritiek in dit opzicht. De toenemende belangstelling voor de groep en de waarneming van de huidige situatie hebben geleid tot de volgende probleemstelling voor het onderzoek.

De huidige praktijk in stedenbouwkundig en architectonisch ontwerpen houdt onvoldoende rekening met de mogelijkheden en beperkingen van de mogelijke veranderingen van de sociaal-ruimtelijke omgeving die voortkomen uit de verdere invoering van ICT. Mogelijkheden en risico’s worden vaker besproken dan ontwerpen. De hoofdreden ligt bij de schaarse kennis bij ontwerpers en ruimtelijke planners, verwoord in ontwerp termen.

We hebben bij de aanpak van dit probleem twee doelstellingen:
— Het identifieren van een aantal kwalitatieve richtlijnen die de ontwerper door het ontwerpproces kunnen leiden op verschillende schaalniveaus en met speciale aandacht voor de woonomgeving.
— Het bieden van inzicht in de rol van ICT toepassingen op de verbetering van de kwaliteit van het bestaan voor ouderen en de geproduceerde kennis toe passen in een specifieke casestudie.

Het eerste deel van het werk (hoofdstuk een tot vier) behandelt de eerste van de vermelde doelstellingen, terwijl de tweede doelstelling het onderwerp is van het tweede deel (de hoofdstukken vijf tot negen).

Deel 1: Kennis ontwikkeling en theorie
Het eerste deel van het werk betreft vooral de methodologische taak om een brug te slaan tussen beschikbare kennis over de relaties stad - telecommunicatie (het product van stadsontwerpers en sociale wetenschappers) en de verwachte ontwerpaspecten (informatie die nodig is voor ontwerpers en stedelijke managers). Uitgaande van de SCOT / PEST aanpak hebben we voorgesteld om de bestaande kennis om te zetten in ontwerpkennis door een aantal stappen te doorlopen. Dit proces wordt weergegeven in het schema: 'Van telematica vernieuwing naar ontwerp’ (figuur 2).

![Figuur 2](image)

Twee, telematicadiensten en functies zijn vooral gericht op de betere sociale klassen ('cherry picking'). Deze categorieën zijn in staat om te betalen voor de diensten en zij hebben de vereiste vaardigheid om de vorderingen ervan te zien. Dit draagt bij tot sociaalruimtelijke polarisatie in stedelijke gebieden (Graham & Marvin, 1996). Het is belangrijk de toegankelijkheid van diensten zo te vergroten dat de categorieën, die dreigen te worden buitengesloten van de mogelijke voordelen van de informatiemaatschappij, erbij betrokken worden. Daarom is het tweede deel van deze studie gericht op de ouderen.

Drie, in vervolg op het voorgaande is het belangrijk om een beleid te ontwikkelen dat reageert op de trends tot polarisatie in de virtuele ruimte. Dit beleid zou ook het ontwerpen van virtuele diensten en hun fysieke positie in de stedelijke situaties moeten omvatten, en ook zou het zich moeten richten op het ontwerpen van toegangspunten tot de cyberspace.

Vier, de invoering van telematicatoepassingen draagt bij tot meer flexibiliteit in sociale en functionele omgevingen. Virtuele modaliteiten vullen de meer traditionele fysieke modaliteiten aan. Meer keuzemogelijkheden dienen zich aan voor aanbieders van diensten om deze diensten te organiseren en aan te bieden en voor de gebruikers om toegang te krijgen tot diensten en mensen. De beslissing zal afhangen van de aard van de dienst en van de specifieke sociaalruimtelijke mogelijkheden van de stedelijke omgeving.

De tussenkomst van telematicatoepassingen in de relaties tussen het tweede niveau (sociale en functionele netwerken) en het derde niveau (individuele netwerken) van het netwerkstadmodel kan worden uitgedrukt in termen van tele-activiteiten. Door de veranderende sociale en functionele omgevingen van de moderne stad nader te onderzoeken, hebben we een lijst van tele-activiteiten gedefinieerd.

De tweede stap in het onderzoek betrof de analyse van deze tele-activiteiten in relatie tot hun tijdsruimtelijke kenmerken. Tijd is beschouwd als duur, moment en frequentie terwijl ruimte is beschouwd als spreiding, locatie en gebruik. Voor ontwerpers is dit fundamentele informatie. Het maakt een meer specifiek begrijpen van de relaties tussen telematica en stedelijke situaties mogelijk.

De derde stap in het onderzoek analyseerde de implicaties voor het eerste niveau van het netwerkstad model (de fysieke omgeving) van de kennis die in de eerste twee stappen was ontwikkeld. Deze implicaties zijn uitgedrukt in ontwerpuitspraken, die suggesties en richtlijnen geven voor de plannings- en voor de locaties van telematica toegangspunten. Hier hebben we ons eerst bezig gehouden met aanwijzingen vanuit enkelvoudige tele-activiteiten, en vervolgens hebben we gekomen naar de geaggregeerde effecten op verschillende geografische schaalniveaus.

Vier categorieën effecten zijn in beschouwing genomen: synergie substitutie, generatie, and verbetering (Graham & Marvin, 1996). Concluderend: een overzicht van ontwerp-mogelijkheden voor de invoering van telematicatoepassingen in woongebieden en de implicaties op verschillende schaalniveaus is ontwikkeld. Dit overzicht bevestigde de 'multiple choice' situatie waarmee ontwerpers te maken hebben bij het ontwerpen van sociaalruimtelijke situaties bij de invoering van telematica. Dit 'multiple choice' effect betreft zowel de ontwerpers als de gebruikers van deze situaties. De 'multiple choice' is niet een absoluut nieuwe situatie voor stedelijk ontwerpen, maar het krijgt meer gewicht door de mogelijkheden die telematica biedt. De hoofddraak van ontwerpers is het maken van keuzes in situaties waarin men telematica wil gebruiken om doeleinden van ruimtelijke planning te bereiken en om mechanismen in te voeren die het maken van keuzes door de bewoners van die ontwerpen locaties mogelijk maken.

Deel 2: specificaties van de casestudies. Het voorgaande deel hebben we afgesloten met de presentatie van ontwerpaanwijzingen voor de invoering van telematica in woongebieden. Deze suggesties dekken een groot gebied aan mogelijkheden. De keuze van de juiste oplossing hangt af van de specifieke sociaalruimtelijke context waarin de ontwerpers optreden. In het tweede deel van deze studie wordt de ontwikkelde kennis toegepast op een specifieke sociaalruimtelijke case. We hebben besloten ons te richten op de groep ouderen en hun situatie nader te bekijken in een bestaande context. We hebben veldwerk uitgevoerd in de woonwijk Mieris in Zutphen. De ondernemende relevante punten zijn gebruikt als uitgangspunt voor het herontwerpen van een woonbuurt van de netwerkstad, waarin telematicatoepassingen worden ingevoerd om deze ten goede te laten komen aan ouderen bewoners. De keuze van ouderen als doelgroep voor het tweede deel van het onderzoek is tekenend voor deze studie van de relatie stad - telecommunicatie. Ouderen zijn inderdaad een minder begunstigde groep, die dreigt te worden uitgesloten van de voordelen van de informatiemaatschappij. Tegelijkertijd bieden de tijdsruimtelijke kenmerken van telematica een passende bijdrage aan de vermindering van de vele problemen van het leven op hoge leeftijd. Daarom vormt de groep ouderen een symbolische groep om de mogelijkheden en beperkingen van telematicatoepassingen te onderzoeken en om de mogelijkheden voor het ontwerpen hiervan nader te bekijken.

De heterogeniteit van de groep ouderen maakt het moeilijk om te komen tot generalisaties. Desondanks, kunnen enkele algemene aspecten van het leven op hogere leeftijd worden aangegeven. Meestal verwijzen deze naar het langzamer werken van lichamelijke functies en van mentale mogelijkheden. De laatste zijn van invloed op veel aspecten van
het leven op de oude dag. Zij verwijzen ook naar gezondheidsaspecten, veiligheid en naar de mogelijkheid om de activiteiten van alledag (ADLs) uit te voeren, om deel te nemen aan sociale evenementen en vrij-
etijdsbeziensheden. Telematica kan in belang-
rijke mate ondersteuning bieden aan oude-
ren die problemen hebben, maar ook kan het
een instrument zijn dat helpt bij het realise-
ren van gewenst gedrag. We hebben de
mogelijkheden van telematica onderzocht
om met bestaande problemen om te gaan en
om nieuwe alternatieven te realiseren met
betrekking tot drie sleutelfactoren

— Onafhankelijkheid of zelfbeslissing. De mate
waarin de ouder in staat is om zelf de koers
te bepalen voor zijn of haar leven (Fisk,
1986).

— Sociale participatie. De mogelijkheid van
ouderen om deel te nemen aan sociale
gebeurtenissen of activiteiten. Dit hangt in
sterke mate af van de mogelijkheden om
belemmeringen in de omgeving te overwin-
nen (Tacken, 1993).

— Gemeenschapszorg. De bereidheid van een
bepaalde gemeenschap om (informele) zorg
te geven aan ouderen die het nodig hebben.
De kwaliteit van leven van ouderen is sterk
afhankelijk van ondersteunende sociale net-
werken (Cullen & Moran, 1992; Knipscheer
et al., 1995).

Veel telematicatoepassingen kunnen voor
ouderen de mogelijkheden verbeteren om
een onafhankelijke leefstijl te voeren.
Telegezondheidszorg kan in zijn vele uiting-
vormen het belang reduceren van vroege
fysieke en cognitieve beperkingen.
Telewinkelen en telebankieren zijn nuttig om
problemen de baas te worden die te maken
hebben met de traditionele uitvoering van
daarmee samenhangende taken: het dragen
van zware tassen, mobiliteitsproblemen of
angst om met geld over straat te lopen.
Tegelijkertijd kunnen teletoepassingen goed
worden gebruikt om de toegang tot gewenste
diensten gemakkelijker te maken: onderwijs,
vrijtijdsbeziensheden, bibliotheek.

De deelname van ouderen aan het sociale
leven is een indicator voor de kwaliteit van
leven. Telematica maakt toegang tot informa-
tie gemakkelijker. Bovendien biedt het moge-
lijkheden tot routeplanning waardoor activi-
teiten buitenshuis gemakkelijker kunnen
plaatsvinden. Veiligheid op straat kan wor-
den verbeterd door tele-surveillances.
Vooral voor de minder mobiele nen de
mogelijkheden tot sociale contacten toe door
een verschuiving aan toepassingen als
videofoon, kletslijnen en boodschappen-
diensten. Deze toepassingen maken het min-
dere mobiele ouderen gemakkelijker om de
verbinding met de sociale context vast te
houden. Dit wordt versterkt door zich meer
bewust te blijven van hetgeen er in de wereld
gebeurt en van veranderende sociale normen

Technologie zou zo ontworpen moeten wor-
den dat deze ook de zorgverlener helpt. De
gemeenschapszorg kan baat hebben bij tele-
maticatoepassingen om meer effectief onder-
steuning te bieden aan ouderen die het
nodig hebben. Kennis en ervaring worden
gemakkelijker toegankelijk. Systemen die op
afstand zaken monitoren en smart-home-
technologie kan worden gecombineerd met
de taak om ouderen bij te staan. Hierdoor
kan het risico van huishoudelijke ongevallen
worden teruggebracht en dit kan de moge-
lijkheden voor informele zorg door familie
en vrienden vergroten.

Deze zaken kunnen een positieve invloed
hebben op de kwaliteit van leven van oude-
ren. Maar deze moet voldoen aan bepaalde
voorwaarden. Er zijn ook bepaalde gevaren
die onderkend moeten worden. Deze hebben
to maken met het ontwerp van de diensten,
met de apparatuur en met de vormgeving
van de activiteitiedieplekken. Een onjuiste
invloering van telematicatoepassingen kan de
positieve mogelijkheden in gevaar brengen
en de risico's doen toenemen. Naar het
voorbeeld van PROMISE (1998) hebben we
vijf factoren beschreven die van belang zijn
voor een correcte invloering van telematica

toepassingen, ook voor ouderen. Deze zijn:
beschikbaarheid, bereikbaarheid, aanschaf-
baarheid, bewustzijn en geschiktheid (avail-
ability, accessibility, affordability, awareness,
appropriateness). Vooral het gemis aan
mogelijkheden, zowel economisch als qua
vaardigheid, kan een belemmering vormen
voor het bereiken van de voordelen van

telematica. Een andere factor die van belang is
betreft het gevaar van toenemend isolement
of van een teruggang in mentale mogelijkhe-
den, doordat deze ook op afstand onder-
steund kunnen worden

Naast het ontwerpen van apparatuur en
diensten is de plek voor de activiteiten en
vormgeving ervan voor ouderen van groot
belang.

De nabijheid van toegangspunten van het vir-
tuele netwerk voor ouderen is een belangrijk
aspect bij het ontwerpen van stedelijke
omgevingen bij de invoering van telematica.
Dit biedt alternatieven voor het thuis doen
van allerlei zaken, hetgeen ook voor ouderen
met een beperkte mobiliteit van nut kan zijn.

Telecentra blijken de best passende oplossing
ten voor de kenmerkende problemen van
ouderen. Dit geldt om de volgende redenen:
— Als eerste vanwege de eerder genoemde
vijf condities, de beschikbaarheid van tech-
nisch personeel en van een helpdesk dragen
bij tot het verminderen van de problemen in
de relatie mens - techniek. De ouder wordt
dan niet alleen belagen in de confrontatie
met de virtuele wereld, die voor een groot
deel onbekend is, maar hij kan geholpen
worden en begeleid naar datgene hij wil.
— Twee, het telecentrum kan een educatieve
betekenis hebben voor de ouder. Het zal
gemakkelijker zijn om te leren hoe bepaalde
doelen bereikt kunnen worden om de appa-
ratuurs te gebruiken samen met anderen,
jong of oud.

— Drie, het telecentrum heeft een sterkere
sociale functie dan andere oplossingen. Als
aantrekkingspunt voor veel mensen kan het
ook een sociaal ontmoetingspunt blijken te
zijn voor de bewoners van de buurt. Dit ken-
merk kan versterkt worden door de vormge-
ving en inrichting van het centrum door
andere faciliteiten aan te bieden die sociale
activiteiten gemakkelijker maken zowel bin-
nenshuis als buitenshuis zoals cafés, ban-
ken, speelplekken en dergelijke.

Oudere bewoners appereirciën in het bijzon-
der de sociale kenmerken van een omgeving.
Het is belangrijk goede sociale omgevingen
te ontwerpen om dit nog eens te versterken.
Als het telecentrum als een sociale katalysa-
tor moet werken dan is het belangrijk dat de
publieke ruimte ook wordt ontworpen voor
dit sociale leven. Een heldere hiërarchie van
woonstraten moet worden nagestreefd om
straten en plekken waar veel actie plaatsvindt
te onderscheiden van rustige omgevingen.
Als er meer telecentra worden gemaakt in
een buurt, dan moeten ze op een of andere
manier aan elkaar worden gekoppeld in een
fysiek netwerk van routes die zijn toegerust met attributen die de sociale ontmoeting gemakkelijker maken.

De beschreven aspecten die te maken hebben met de invoering van telematicatopassingen kunnen ertoe bijdragen dat de situatie voor ouderen wordt verbeterd. Hun toepassing hangt af van de specifieke kenmerken van het stedelijk gebied waarin de ingreep plaatsvindt. Daarom hebben we gebruik gemaakt van de resultaten van een casestudie in de woonwijk Meerzicht in Zoetermeer.

De eerste stap betrof het uitvoeren van een survey onder oude inwoners van dit gebied. De survey bestond uit een gestructureerde vragenlijst en een verplaatsingsdagboekje. Deze gaf informatie over de feitelijke situatie van de steekproef in een bestaande sociaalruimtelijke situatie. Het doel was het ontdekken van eventuele belemmeringen voor het uitvoeren van het gewenste gedrag door ouderen en te achterhalen welke mogelijkheden er waren om deze met behulp van telematica te ondervangen of op te heffen.

Deze informatie, tezamen met de kennis verkregen uit de voorafgaande delen van het onderzoek, is gebruikt voor een herontwerp van Meerzicht als een buurt van de netwerkstad, waarin telematicatopassingen worden ingevoerd ten bate van de ouderen.

Het voorgestelde ontwerp (figuur 3) is op de eerste plaats het herontwerp van de relaties tussen de verschillende delen van de buurt. Het betreft de routes voor fysieke communicatie en de verschillende schaalniveaus waarop ingrepen plaatsvinden en de plek en betekenis van telematica toegangspunten met betrekking tot routes en schaalniveaus. Drie schaalniveaus zijn onderscheiden:

— De wijk als een geheel en zijn mogelijke rol binnen territoriale netwerken op stads- en stadsgewestelijk niveau.

— Het district als basis eenheid binnen lokale netwerken.

— De woning als vertrek- en aankomstlocatie voor dagelijks sociaalruimtelijk gedrag van mensen.

Het leidende concept in het ontwerp is het waardevolle karakter van de kruispunten van netwerken op verschillende ruimtelijke schaalniveaus. Polen worden gecreëerd op deze netwerken waar tele-activiteiten zijn ingevoerd overeenkomstig de betekenis die de kruispunten hebben. De polen op de hogere netwerken hebben betekenis op het stads- of regionale niveau door hun gemakkelijke fysieke bereikbaarheid. Hier hebben we diensten en activiteiten gesignaleerd die mensen vanuit de hele wijk kunnen aantrekken en vanuit het hele stedelijke gebied.

Polen die gesignaleerd zijn op locale netwerken huisvesten diensten en activiteiten die een ondersteunende functie hebben voor de lokale gemeenschap. Aandacht is besteed aan de voorwaarden die eerder zijn vermeld voor het ontwerpen van telematicatopassingen voor ouderen. De voorkeursoptie was het telecentrum en de sociale mogelijkheden van dit ontwerp zijn verder uitgewerkt.

De polen die op de verschillende territoriale netwerken zijn ingebracht, zijn onderling verbonden door fysieke netwerken van routes en paden. Deze structuur weerspiegelt de synergie tussen virtuele ruimten en fysieke plekken. Deze synergie is een belangrijke voorwaarde om telematicatopassingen effectief in een gebied in te voeren. De toegangspunten worden beschouwd als deuren naar de virtuele netwerken en deze deuren zijn gesignaleerd langs de hoofdroutes in fysieke plekken. Op hun beurt krijgen de paden die de polen verbinden weer meer betekenis door de verplaatsingen van mensen die voortkomen uit de aanwezigheid van de polen. Hier kunnen we generatie-effecten hebben door het ontstaan van nieuw gedrag en effecten van de verbetering van de verbetering (verbeterde efficiency en capaciteit) welke te danken zijn aan de aanwezigheid van alternatieven die voortkomen uit de invoering van telematica.

Figuur 3
Ontwerpvoorstel voor Meerzicht.
Enkele hoofdconclusies
De relatie stad - telecommunicatie is complex en tegenstrijdig. De erme samenhangende ontwerpspecten zijn nog complezer. Het is moeilijk om een directe en eenduidige verbinding te vinden tussen telecommunicatie, sociale en politieke dynamiek en specifieke ontwerpoplossingen voor stedelijke gebieden. Desondanks, is er een overzicht ontwikkeld van suggesties die kunnen worden toegepast in verschillende ruimtelijke situaties. We hebben voor de netwerksstad als ruimtelijke referentie gekozen, omdat we geloven dat dit model beter geschikt is om de mogelijkheden van telematica te benutten.

De invoering van telematicatopepassingen en dus de verbonden ontwerpspecten van de verbindingen tussen virtuele ruimten en fysieke plekken voegen andere mogelijkheden toe aan het ontwerpen van stedelijke gebieden. Alternatieven welke niet bruikbaar waren in een wereld die gedomineerd wordt door fysieke communicatie, worden haalbaar als virtuele verbindingen worden gekoppeld aan fysieke modaliteiten. We hebben gezien dat er met de bijdrage van telematica meer keuze komt in de relaties tussen het derde niveau van het netwerkstadmodel (het individu in zijn/haar dagelijks gedrag) en het tweede (de sociale en functionele netwerken). Individuen mogen zich verheugen in meer alternatieven om functionele taken uit te voeren en om in contact te komen met andere mensen. De ontwerper zou deze ‘multiple choice’ moeten nemen als basis input, terwijl hij probeert om gebieden te ontwerpen waarin keuze een reële mogelijkheid is. Maar dit hangt ook af van de trends rond de reorganisatie van sociale en functionele omgevingen.

De invoering van virtuele alternatieven van diensten en functies in woongebieden kan slechts worden gedaan als deze diensten en functies gereorganiseerd zijn in de vorm van netwerken. Twee hoofdconclusies kunnen hieruit worden afgeleid. Aan de ene kant krijgt ontwerpen meer de functie van het organiseren van keuzes dan voorheen. Dit beheert zowel op het niveau van het mogelijk maken van veelvuldige opties voor individueel gedrag, als op het niveau van de beslissing welke combinatie uit de vele opties, die door telematica beschikbaar komen, in het ontwerp zal worden ingebracht. Aan de andere kant is het belangrijk om nieuwe methoden van samenwerkend ontwerpen te ontwikkelen, waarin verschillende personen hun expertise inbrengen om zo te komen tot een meer efficiënte organisatie van stedelijke gebieden.

Richtingen voor toekomstig onderzoek
De rol van de keuze organisator die in toenemende mate aan de ontwerper wordt tobedeeld zou onderwerp van een meer gedetailleerde studie moeten zijn. Hoe kan een systeem besluitvorming ondersteunend systeem worden ontwikkeld om de keuzes van de ontwerper beter te orienteren binnen de vele mogelijke varianten die door telematicatopepassingen worden geïntroduceerd.

Management van samenwerkend ontwerpen, van politieke en economische keuzes naar de ontwikkeling van specifieke diensten en hun toepassing in het ontwerpen, moet meer aandacht krijgen in relatie tot de mogelijkheden ingebracht door telematica. De ontwikkeling van diensten en de reorganisatie van de functionele omgeving zijn nog steeds verderegaande processen. De betrokkenheid van stedebouwkdigen vanaf het begin van deze processen is nodig om de diensten te ontwikkelen die nodig zijn voor taken van de ruimtelijke planner. In het bijzonder is onderzoek nodig op de terreinen van handelszorg en onderwijs. Projecten en experimenten worden nu uitgevoerd, maar zij betrekken slechts zelden ruimtelijke planners erbij.

Meer onderzoek en experimenten zijn ook nodig rond diensten en faciliteiten voor een verouderende samenleving. Een ‘informatie-maatschappij voor iedereen’ zou hierbij de leidende gedachte moeten zijn.

Dit werk zelf kan worden beschouwd als een startpunt voor meer onderzoek naar de ontwerpspecten van de relatie stad - telecommunicatie. Het zal bijzonder nuttig zijn om te beginnen met de identificatie van test- velden waarin experimenten gerealiseerd kunnen worden om de gevolgen voor de werkelijkheid waar te nemen. Ongetwijfeld is dit de volgende stap in de richting van een beter begrip van de ontwerpspecten die samenhangen met telematica.
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