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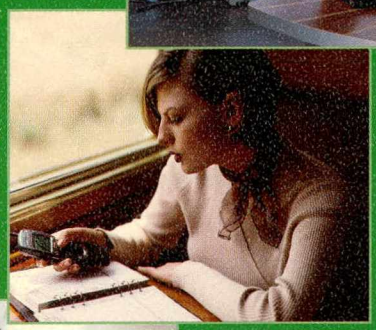
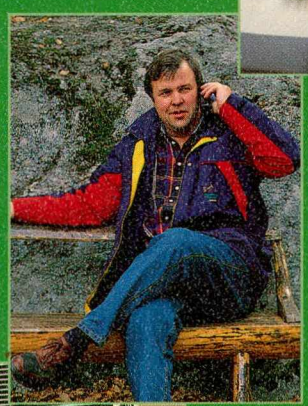
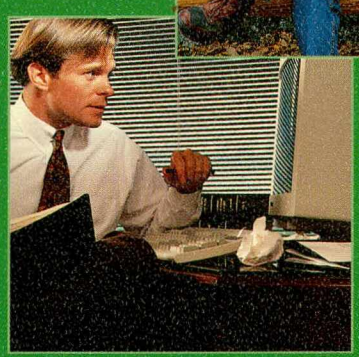
Juha Nurmela







Three Years of the Information Society

A Longitudinal Survey of the Use Made of Modern Information and Communications Technology in Finland.

Reviews 2001/4

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Foreword

This fifth report on the project "The Finns and the Future Information Society" contains further results regarding the set of 1200 Finnish people who were interviewed for the 1996 and 1999 surveys of the use of new information and communications technology. This therefore represents a panel survey, in which the use of a fixed body of respondents enables a close examination to be made of changes in the use made of such technology at the individual level. In the first place, it is possible to follow changes in the extent and intensity to which individuals make use of these devices and to trace improvements in their skills for doing so, and secondly it is possible to follow "flows" of respondents from one state to the next. Although two cross-sectional surveys may provide an opportunity for examining changes, they allow no more than a comparison of skills and use between two groups at different points in time. In this sense, a panel survey provides a better and more analytical description of changes. The three years covered by this survey constitute a very interesting period, during which many phenomena associated with modern technology gained in currency and lively discussions took place on the Information Society at large.

This publication also constitutes a report on the second phase of the research as such. It has been possible so far to perform only a descriptive analysis, however, and there are still many questions and perspectives connected with the material that remain unanalysed, including the connections and dependence relations between the phenomena. For this purpose, collaborative networks have been set up with universities and other bodies in order to initiate new research. Work on this material will continue at Statistics Finland as well for the duration of 2001, the next target being modelling of the process of diffusion of new information and communications technology, in which various growth models will be fitted to the data describing the changes that have taken place in order to gain a better understanding of where we are going. A modelling of this kind may prove useful for planning and steering purposes within society.

The following instances have been involved in financing the project on "The Finns and the Future Information Society": the Finnet Association, Sonera, Finland Post Ltd., the Finnish Broadcasting Company, the Ministries of Education, Transport and Communications, Finance and the Interior, and the Association of Finnish Local and Regional Authorities. The Chairman of the Steering Group has been Risto Lehtonen of Statistics Finland, and its other members Liisa Hirvonen of the Ministry of Education, Tatu Tuominen of the Ministry of Transport and Communications, Juhani Korhonen of the Ministry of Finance, Pekka Urjanheimo of the Ministry of the Interior, Ulla Artte of the Finnet Association, Heikki Nikali of Finland Post Ltd. and Marja-Liisa Viherä of Sonera. The members of the steering group have supported the project in numerous ways and have helped to ensure adequate financial backing. We wish to express our grateful thanks to them for their contributions.

The results of this research and the conclusions reached are solely the responsibility of the author and are not attributable to Statistics Finland or to any other sponsor of the project.

Helsinki, 15.5.2001

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Contents

1 Introduction

This report is based on a set of 1200 Finnish subjects interviewed in 1996 and again in 1999 with regard to the use that they made of modern information and communications technology. It thus represents a three-year panel survey, in which the existence of constant set of respondents makes it possible in principle to follow the changes that have taken place in the use of modern information and communications technology closely at the individual level. It is possible to determine, for instance, whether an individual respondent increased the extent or intensity of his use of such devices over the period in question or whether his skills in doing so improved, although such a close individual study would not be entirely justified on the basis of structured interviews but would really require thematic interviews. Panel data can very well be used for describing "flows" from one state to another within a set of respondents, however, e.g. non-users of mobile phones who become users or vice versa.

Many changes can occur within a group of respondents in three years which will not be revealed by cross-sectional surveys of flows, even if these take place at the individual level, and although two sets of cross-sectional data may be obtained, they will only be indicative of the "skills" or "usage" levels of two separate groups at distinct points in time, albeit both representative of the basic population of which they constitute samples. A set of panel data provides a better and more analytical description of the changes that have taken place, however, and allows the use of retrospective questions if necessary, even though people's recollections at later points in time are known to be somewhat selective and "charitable" as far as their own actions are concerned, which is liable to undermine the reliability of retrospective questions relative to ones focused specifically on the current situation or the immediate past.

The period of time from autumn 1996 to autumn 1999 constitutes a very interesting one with respect to the present topic, as many of the phenomena associated with modern technology began to gain currency at that time and a lively discussion took place on the information society. The Ministry of Finance reports on "Finland's Way to the Information Society" had been released in 1995, and the Council of State and various ministries approved and implemented measures related to this topic around that time. The mobile phone spread to the households of Finland faster than any other device has ever done, and the scope of its use rapidly expanded from speech alone to include text messages. At the same time, other media harnessed the data and text message networks for their own purposes, the local telephone cooperatives were converted to limited companies and the Finnish postal and telephone services were divided up and privatized. New data network operators sprang up on the market like mushrooms and their stock exchange ratings soared instantly to dizzy heights, while Nokia's success story proceeded from one record turnover to the next

It may be said with some justification that ordinary Finnish citizens were forced to re-evaluate their own attitudes towards the information society and the new data and communications technology that it offered them many times over during those three years. At least the public sector was exerting considerable social pressures on them to join the information society, so that they would not be excluded from something that, although rather indeterminate, sounded as if it was likely to prove important in the long run. It may be assumed that people went along with this "information bandwagon" by buying more technical devices, using them assiduously and acquiring the necessary new skills for this.

1.1 Frame of reference for the survey

How is it best to approach the study of changes in terms of flows? In the first place, Finnish house-

holds will have been affected by a substantial number of changes within the three years in question. Many young people will have moved away from home, and this will have influenced the occurrence of modern technical devices both in their households and in those of their parents, the devices most typically affected being conventional wired telephones and home computers. Frequently those remaining at the old home gain access to a computer if this is left behind, while the young people may lose their access to a wired telephone and thereby their home Internet connection etc. Changes of this kind, in both directions, would also appear to have occurred at people's workplaces in very many cases. All in all, changes were continually taking place in the operating environments in which the new information technology was being used, perhaps most of them making its use easier, but undoubtedly creating more difficulties in some cases.

We are dealing here, of course, with the adoption of novel technical products and their assimilation as part of people's everyday lives, which means that there must be a motive for their acquisition and use, i.e. profit, entertainment, fashion, social pressure, the desire to be different etc. The theories of the diffusion of innovations frequently speak of earlier adopters etc., ending up with late adopters, with most of the population lying somewhere in between, while other approaches may set out from a wider perspective in which new information and communication technology is examined as "a system with laws of its own", as in the following quotations from Mika Pantzar (2000).

"Artefacts, people, ideas and organisations are not merely embedded within one another to form systems and structures, but these systems also form emergent, unpredictably developing hypercycles that cannot be referred back to individual actors. Actors "generate themselves in new forms", as it were, by participating in interactive entities along with other actors. Everyday life is insufficient for describing such entities, but rather the concept of emergence is essential for this, for the entity is greater than the sum of its parts and its development is frequently surprising and uncontrolled, although also cumulative." (Pantzar 2000, 113).

"Actors create through their own actions a macro-environment which increasingly imposes conditions on them, so that as the process advances, the original actors are increasingly obliged to subordinate themselves to the logic of the entity as a whole and begin to act in an ever more predictable manner until they finally become components and building blocks in the greater entity. For scholars such as Max Weber or Josep Schumpeter the end point in this development is marked by structures that have become fossilized through the possession of classical features, and the replication model similarly presupposes that the development of a division of labour and the integration of functions will always call for fossilization processes. Routines and established bureaucratic forms of organization can be manifestations of fossilization at a lower level of organization which is essential for the entity as a whole." (Pantzar 2000, 115–116).

"Memeology is the epidemiology of thoughts and ideas. Alongside the classical models for the diffusion of innovations, we may propose a doctrine of the contagious transmission of ideas that draws attention to the significant fact that structures of social interaction essentially influence the spread of a disease, e.g. mobile phone fever. New ideas spread considerably more slowly in the traditional class society, in which the classes have little to do with each other, than they do in our mass society, where we can find ourselves dealing with anybody at all. This may partly explain the rapid dissemination of technical innovations in the culturally homogeneous society of Finland. It is not that society's values are particularly favourably disposed towards advanced technology, but it is simply a matter of the fabric of which Finnish society is made up. Research into values as such has not shown the Finns to differ from other Europeans in being more accommodating with regard to technology." (Pantzar 2000, 120).

"Radically new, successful products such as the motor car or the computer do not adapt themselves to the environment or replace something that existed earlier, but rather they create a selective environment that will lead to their acceptance, e.g. a demand and a type of person who will favour such products. It would have been difficult

to predict in advance the popularity that the mobile phone has achieved, because its market potential revealed itself only as the innovation spread and came to be used... It is therefore reasonable to adopt an organic approach and ask to what extent these products are able to create a favourable environment for themselves. It is not a matter of success generated by advertising, for instance, but of some more fundamental change: an emergent developmental logic involving needs and modes of utilization that is influenced by pioneer consumers who are active in creating new practices. The development of a need, e.g. its expression in language, is to a great extent determined by the interaction between human beings and artefacts. How else would it be possible for interactive technology to develop?" (Pantzar 2000, 123–124).

The above idea put forward by Pantzar of examining innovations as systemic, by analogy with an infectious disease, provides a suitable metaphor for considering how respondents belonging to different sectors of the population may advance in their adoption of technical devices and their mastery of them. In this sense it is well suited as a perspective from which to read this report. Are new structures and functions emerging that obey laws of their own, and can the actions of the panel members and the changes in these be interpreted from such a perspective?

When examining the information society and its data networks at a practical level, it is necessary to consider whether there is any "other" with whom to communicate that can motive the use of these instruments. Marja-Liisa Viherä analyses the situations in which new information and communication technology might be used by means of the concepts of access, competence and motivation. The user must possess all three of these, but there must also be at least one person or other instance of interest to the user that possesses the necessary access, competence and motivation in order for communication to take place. In the empirical part of this work we will examine changes in the three indices of telecommunications potential proposed by Viherä (1999) over the three years in question.

New information and communications technology and its acquisition and use can also be examined as a question of resources (see Nurmela et al., 2000), in which case it is necessary to consider economic aspects, knowledge and knowhow before addressing matters of reluctance or inability to adopt or use new devices.

It would seem important in general to beware of describing changes simply on the basis of impressions gained from rational ideas or actions. When examining innovations connected with the saving of energy, for example, it has been concluded that purchase decisions are frequently made in the presence of a conflict of interests within households, without any substantial element of rational planning, as if mudding trough a sea of alternatives (Nurmela 1996). We can scarcely imagine that the adoption of new information and communications technology will be any more rational than the acquisition of any other durable goods.

1.2 Structure of the report

We will first look briefly at whether the subjects who agreed to a repeat interview differed from those who refused in terms of the 1996 data, and whether they differ from those belonging to the new sample taken for 1999. A detailed analysis of the representativeness of the sampling is presented in Appendix 1. The results provide a basis on which to judge whether the assessments of change flows can be generalized to apply to the behaviour of the Finnish population as a whole.

The report will then go on to examine the changes themselves by topics in terms of the age and sex of the respondents. The empirical part begins with an examination of changes of opinion, after which attention is turned to the adoption of the mobile phone. The third topic is the development of computer skills, and a separate chapter is devoted to the abilities needed for participation in the information society. Once these topics have been dealt with, an analysis is made of trends in the indices of communication abilities among the respondents. The report ends with a compilation of the principal findings and evaluations of them from both a sociological and methodological viewpoint.

2 Who took part in the follow-up interviews?

It may be appropriate to begin the description of the material by explaining how data acquisition for the project on The Finns and the Future Information Society was conducted as a whole in 1996, so that the nature of the various sets of material and the possibilities for making comparisons between them will be better understood. The first round of interviews, which took place in November and December 1996, was based on a sample of 1432 households, in which the intention was to interview all the members aged 10–74 years. These interviews consisted of a household part and a personal part, in addition to which all subjects aged over 12 years were asked to fill in a questionnaire asking about their attitudes towards the future and their interest in teledemocracy. At the end of the questionnaire was an item in which the respondents were asked to give permission for their contact information to be retained for the purposes of a follow-up interview at a later date. The eventual material accepted for the 1996 survey comprised interviews with 2362 persons representing 1080 households, of whom 1547 indicated acceptance of the idea of a follow-up interview, including 88% of those aged 12–17 years, 83% of those aged 18–22 years and 77% of those aged 23–74 years (Reviews 1997/12).

When planning the new round of personal and household interviews, to be conducted in October–December 1999, the basic body of subjects comprised those who had given their permission for a follow-up on the previous occasion. An updating run performed in August 1999 and various updates made in the course of the interviewing eventually led to the obtaining of at least some kind of contact information in the case of 1529 of these persons, of whom 1246, or 81.5%, were actually interviewed, representing a very low level of loss for a panel survey of this kind. Similarly, those who had given their permission in 1996 represented 942 households, 83.4% of which were represented in the actual interviews. It should also be noted that more than a fourth of those who had given their permission for a follow-up were living in a different household in 1999 from that of 1996. In addition, a new random sample of 1059 households was taken, containing 2340 subjects aged 10–74 years, of which 69% of the households and 64% of the subjects eventually took part in the interviews, so that at least in this respect it could be said that the follow-up group was particularly active in its participation, considering that a time interval of three years had elapsed. The new sample thus provided replies from 1500 respondents representing 730 households. This new sample will be referred to below as the non-panel subjects/households. A new teledemocracy survey was also carried out in 1999, but only with subjects aged 15 years or over (Nurmela et al. 2000).

The above means that a number of sets of material are available for studying the changes that took place over the interval in question, in that comparisons can be made between the following:

a) Two cross-sections data sets: the whole 1996 set of household and personal replies vs. the household and personal replies for the new sample in 1999. This will be referred to as the **non-panel comparison** in the empirical section below.
b) Replies in 1996 from those who agreed to give a follow-up interview vs. those refused to consider a follow-up interview.
c) Replies in 1999 from those who had agreed in 1996 to give a follow-up interview vs. replies from the non-panel group in 1999.
d) The true panel survey: replies in 1996 from those who agreed to give a follow-up interview vs. replies from the same group in 1999.

All these modes of comparison will be used for assessing the representativeness of the material,

while the analysis proper will be based on comparison (d), although using (a) to some some extent for reference purposes.

2.1 Comparison between those agreeing to a follow-up interview and the others in the 1996 material

The representativeness of the material was assessed by applying the χ^2 test to a comparison between the distribution of replies among the 1996 respondents who agreed to a follow-up interview and that among the respondents who did not, first in relation to the background data and then with respect to the actual variables studied. The differences and similarities between the groups will be summarized briefly below. It can be assumed that a subject who is "involved in the information society" is more likely to agree to a follow-up interview than a person who feels "left out" of that society and that an element of selectivity of this kind should be taken into account when considering the distribution of answers in the follow-up survey in 1999. Detailed results of this comparison are presented in Appendix 1, and only condensed information on the similarities and differences will be presented below.

Viewed overall, it may be said that the differences between those who would and would not agree to a follow-up interview at some future date were very small, although a higher than average proportion of the young people agreed to a second interview and a higher than average proportion of those over 50 years of age refused. It also seemed that those who agreed to another interview had a more favourable attitude towards the future, so that there may have been something else lying behind the changes in attitude than simply a growth in realism with age. In other words, when interpreting the flows perceivable in the panel material, we should bear in mind that the group contains an overrepresentation of young people, those who face the future with confidence and those who are relatively active in outlook.

2.2 Comparison between the panel group and the respondents in the new 1999 sample

And what does the situation look like as far as the respondents in 1999 are concerned? Do the answers given by those who had agreed to a follow-up interview differ systematically in any way from those obtained from the new sample of subjects? These questions are in a sense crucial to the generalizability of the results with regard to the end of the time interval discussed here.

There are many ways in which we could compare these two groups of respondents. At least in principle, the promise given three years earlier obliges the panel subjects to participate this time, which should mean a higher response percentage than for the new random sample. Also, we can assume that those who were not interested in answering another questionnaire would not have been active in acquiring new information and communications technology. The clearest and simplest way of investigating whether refusal to participate in a further survey was a sign of a sense of alienation would be to compare the reasons for non-participation between the panel group and the new sample. As a summary of this, it may be noted that the loss of less than 20% of the group that had previously agreed to a second interview would not appear to entail any special features by which these people could be said to deviate essentially from the original group who agreed to a second interview, with their slight accent on the younger age groups and a more favourable outlook on the future. It would not seem, therefore, that those who felt "left out" of the information society had systematically declined to take part in the second round of interviews.

All in all, it may be maintained that the panel data provide good opportunities for making deductions with regard to changes in the use of new information and communications technology amongst the Finnish population as a whole. Thus the results to be presented in the forthcoming chapters should give a fairly reliable picture of phenomena connected with the use of such technology and the skills required for this as far as the population in the age range 15–74 years is concerned, at least where clear-cut changes are detectable.

3 Three years of the Information Society

3.1 Approaches

We shall examine here by means of tables the changes that took place in the use of modern information and communications technology in Finland over the period in question and in people's abilities to use this technology and their attitudes towards it. The panel data can be used for this purpose in a number of ways:

A) One can set out to examine the distributions of the whole set of respondents or those belonging to groups defined by background variables with respect to their use of a certain technical device, e.g. the mobile phone, in 1996 and 1999. Cross-tabulation of the figures for the two years will provide an impression of the transitions that took place between the classes of users and non-users, and thereby of the permanence of the phenomenon, the main direction of change and the existence of counter-flows.

B) Changes can also be examined at the individual level, by determining for each respondent whether the person's situation with respect to a particular technical device altered during the period or not and classifying the changes as either increases or decreases in use. These changes can then be assessed for the whole panel or for specific groups defined in terms of background variables by determining their distribution among the three classes: a) no change, b) increase, c) decrease. This approach is more sensitive to changes at the individual level than that described under A.

C) The third possibility would be to calculate correlations between the replies for the two years. This would yield a result which was at least conceptually an "average view" of that provided by approach A. No calculations of this type were attempted here, however, on account of the shortage of time.

D) The present sets of material provide an opportunity for making the methodologically very interesting comparison between the distributions of answers in the new sample taken for 1999 and the panel sample. This would furnish information on the extent to which the change data obtained from the at least moderately representative panel material differed from the corresponding data derived from a comparison between the new cross-sectional results and those for the 1996 material. In other words, we would be seeking an answer to the question of how well two random samples taken at different points in time serve to describe changes occurring in the basic population relative to a set of panel data covering the same time interval. Comparisons of this kind will be made below when it is reasonable to do so as far as the theme under discussion is concerned. The new sample taken in 1999 will be referred to in this connection as the non-panel sample.

The main point of the analysis is to consider whether skills in the use of information and communications technology improved over the period concerned and whether use as such became more frequent, i.e. whether this technology became more firmly established as a part of people's everyday lives. No weightings of individual observations are used in the analysis of the panel data, as we are primarily interested in changes in the activities, skills and views of the panel members rather than the frequency of such features in the population as a whole. As participation in the panel did not appear in the light of the analysis performed in Chapter 2 to be selective in any particular way, it should be possible to generalize the findings to apply to the whole population over the period in question without the use of weightings. This may seem a somewhat lax approach in terms of statistical theory, but it is justifiable if only because it clarifies the interpreta-

tion of changes occurring within the panel material. As far as generalizability is concerned, significant reference material is available from the cross-sectional data for 1996 and 1999, where weightings are used when calculating the distributions of changes.

Although it is common in many connections to employ only age as a variable when examining changes in behaviour, as the differences between the sexes prove to be insignificant, both age and sex are used here as background variables in the tabulations. We will begin our examination of the changes with the respondents' attitudes towards the information society and the future in general, as it is possible to detect elements of both external compulsion and the individuals' own motivation lying behind the changes in these attitudes. The central role of motivation has been recognized in many connections recently, including discussions of the slowness with which electronic commerce or WAP mobile phone technology have been adopted. We shall proceed in the next two sections to consider the spread of mobile phones and changes in attitudes towards these. The sixth and seventh section will then be concerned with the use of computers and network connections. The final topic for empirical analysis will be the occurrence of the indices of telecommunications capabilities proposed by Viherä (2000), which will be discussed from a number of perspectives.

4 Changes in opinions and attitudes

We will begin our examination of the changes by focusing attention on differences in attitudes and opinions between the two years, since this may also assist us later in understanding the patterns of adoption and use of certain forms of modern technology. An indication in this direction was obtained when re-calculation of Viherä's indices of communications capabilities suggested that the index of motivation had not increased at all over a period of three years (Viherä and Nurmela 2000).

We will begin our analysis with a comparison of opinions suggestive of attitudes towards technology based on the panel data. The basic point of departure is to determine how the answers to the same questions altered over the three years, after which the changes can be related more precisely to the background variables.

4.1 Attitudes towards technology

Where the reactions to the statement quoted in Table 4.1 were evenly distributed in 1996, there were 60 more people in 1999 who regarded it as appropriate in their situation, an increase of 10%, i.e. the incidence of a favourable attitude towards technology had grown by that amount. Of the 558 respondents who had been of the opinion that the statement did not apply to them in 1996, 162 had altered their views by 1999, while the flow in the opposite direction had been much smaller, in that only 102 out of 549 respondents had become less favourably disposed towards technology. The same trend is also detectable if we compare the opinions of the non-panel sample in 1999 with those of the whole sample in 1996.

If we now look at the results of a comparison of opinions at the individual level between 1996 and 1999, we obtain confirmation of the general picture given above. Here the changes are recorded in terms of the four alternative answers, that the statement corresponded to the respondent's opinion: 1 = very well, 2 = fairly well, 3 = rather poorly, 4 = very poorly, so that the picture obtained is a more detailed one than that provided by the previous table. On the other hand, only the direction of the change is taken into account here and not its extent, which could in principle vary from a step of just one category to a switch from one extreme to the other. The main weakness of this simplified treatment, however, lies in the fact that without reference to the previous table the basic distribution of answers would remain obscure. Table 4.2 again indicates a preponderance of moves in a more favourable direction, and also suggests that the difference between the men and women in this respect was not great.

What does the situation look like when examined on an age basis, however? As may be seen in Table 4.3, the women changed their opinions slightly more often than the men, and the young

Table 4.1. *Numbers of participants in the 1996 and 1999 panel surveys regarding the statement "I am interested in modern technology and purchase it whenever I can afford it" as applying or not applying to them*

Year 1999	Year 1996		Total 1999
	Applies	Does not apply	
Applies	447	162	609
Does not apply	102	396	498
Total 1996	549	558	1 107

Table 4.2. *Percentages of participants changing their response to the statement "I am interested in modern technology and purchase it whenever I can afford it" between the 1996 and 1999 panel surveys, by sex*

Sex	Applies less well than in 1996	No change	Applies better than in 1996	Total no. (100%)
Males	20	51	29	547
Females	23	48	30	600
Total	21	50	29	1 147

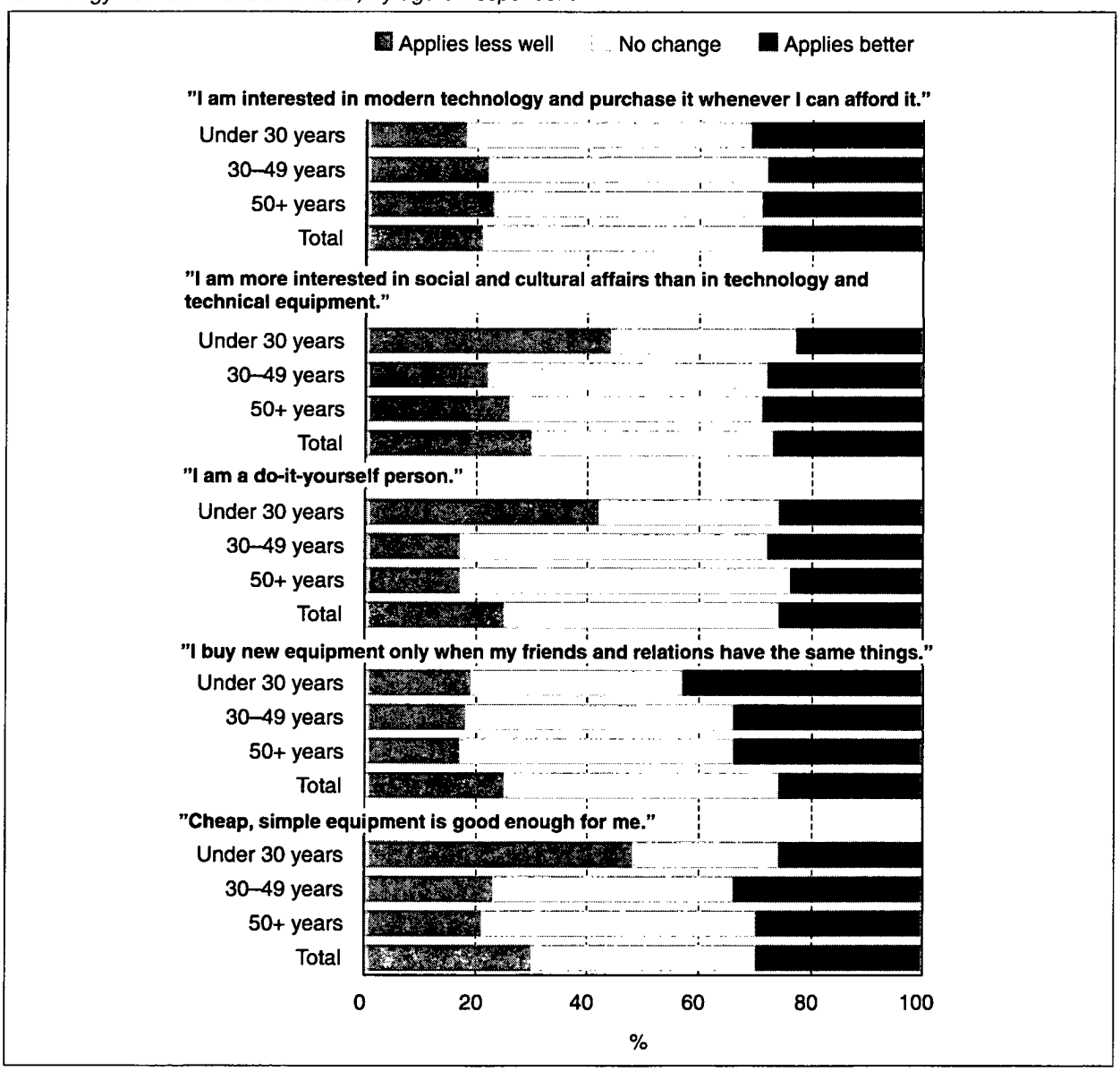
Table 4.3. *Percentages of participants changing their response to the statement "I am interested in modern technology and purchase it whenever I can afford it" between the 1996 and 1999 panel surveys, by sex and age*

Age and sex	Applies less well than in 1996	No change	Applies better than in 1996	Total (100%)
Males under 30 yr	19	54	28	138
Males 30–49 yr.	20	50	30	236
Males over 50 yr.	22	51	27	173
Females under 30 yr.	18	48	34	141
Females 30–49 yr.	24	49	27	258
Females over 50 yr.	25	46	29	200
Total	21	50	29	1 147

women in particular had become much more favourably disposed towards the acquisition of modern technology. Opinions on other matters will not be examined separately for men and women but only by age, as the differences between the sexes were minor.

The other statements relevant to the respondents' attitudes towards technology are gathered together in Figure 4.1, where they are classified by age and by changes in their applicability observable between 1996 and 1999. The subjects under the age of 30 years had altered their opinions very much more often than those in the older age groups, and predominantly in a more favourable direction. The alterations recorded in this youn-

Figure 4.1. *Percentage changes in experiences of the applicability of statements regarding attitudes towards technology between 1996 and 1999, by age of respondent*



gest age group can in fact be regarded as quite substantial ones for a period of no more than three years, and it was only with respect to their interest in technology and its acquisition that more than half of this age group had kept to their earlier opinions. It may be that pressure from the social environment and the power of examples among their peers had moved these young people in particular to change their opinions. Especially notable differences in opinion existed between those aged under and over 30 years in the case of the statements *"I am more interested in social and cultural affairs than in technology and technical equipment"*, *"I am a do-it-yourself person"* and *"Cheap, simple equipment is good enough for me"*. All three of these were markedly less applicable to the young people than they had been three years earlier, whereas almost a half of those over the age of 30 years had not altered their opinions on these points and slightly more regarded the statements as applying to them better than considered them to apply less well. It is also noticeable that where the young people had come to place more emphasis on higher quality and more expensive technology, the older age groups were more than ever inclined to rely on basic equipment.

If we compare opinions in 1996 and 1999 on the basis of the non-panel data, the favourable attitudes of the young people towards technology and their emphasis on quality still emerge clearly, but not their declining interest in do-it-yourself or in social and cultural affairs. One explanation for this difference may lie in the contextual influence of the interview situation, in that the young people taking part in the follow-up interviews may have unconsciously adopted more favourable attitudes towards technology for the sake of the subject itself than those being interviewed for the first time.

4.2 Orientation towards the future

Attitudes towards the future were assessed using a summative index derived from the same four questions as in 1996 (Nurmela 1998):

Question 1. How do you rate your chances of influencing what happens in society? Are they: a) good, b) reasonable, c) poor, d) or is it impossible to say?

Question 2. Do you regard changes in society as taking place: a) too quickly, b) too slowly, c) at a suitable speed, d) or is it impossible to say?

Question 3. Do you regard changes in society as taking place: a) in the right direction, b) in the wrong direction, c) scarcely any changes taking place, d) or is it impossible to say?

Question 4. Which of the following corresponds best to your view of the future: a) the future is a worrying thought, b) the future is full of opportunities, c) the future will mostly resemble the present time, d) cannot say?

The index of orientation comprises four categories: 1) future-oriented, 2) present-oriented, 3) past-oriented and 4) oriented elsewhere. The next table groups the respondents according to their orientation in 1999 and examines the distribution of each group by orientations in 1996.

A clear increase is discernible over the three years in the number of future-oriented subjects (201 → 252 respondents) and a clear decline in the number with orientations elsewhere (400 → 351). Only in the present-oriented group had more than half of the respondents been of the same orientation in 1996. Most of those who had adopted a future orientation in the meantime had previously been oriented towards the present, whereas those with a present or past orientation had frequently been indeterminate in their orientation earlier. On

Table 4.4. *Orientation towards the future as a percentage among the panel participants in 1999, by orientation in 1996*

Orientation in 1999	Distribution of orientations (%) in 1996				Total in 1999 (100 %)
	Future	Present	Past	Elsewhere	
Future	44	26	5	27	252
Present	11	52	9	28	324
Past	7	13	41	40	182
Elsewhere	12	20	19	50	351
Total in 1996	201	326	182	400	1 109

the other hand, those who had changed to an indeterminate orientation had mostly been oriented towards the present or past earlier, although as many as 10% had abandoned a future orientation.

There were no significant differences in distribution between the sexes, but analysis by age revealed the surprising fact that the group aged under 30 years had remained the most stable in their orientation towards the world, while those in the older groups had more frequently altered in orientation. The percentage increase in future orientation had nevertheless been higher among the younger respondents. Those aged over 30 years who were of a future orientation in 1999 had more often been present-oriented in 1996 than in the younger group. All in all, it may be said that the respondents had become more optimistic about the future in the three-year interval, and the same impression is gained on examining the answers to the same basic questions in the 1996 material and the non-panel data for 1999.

4.3 Views on data security

Fears regarding data security were assessed in terms of the sum of a number of variables that had been dichotomized in terms of those who agreed or disagreed with the given statements.

a) *The data gathered by the authorities in their computer registers are a threat to personal privacy.*
b) *People are too often asked for their social security number.*
c) *For the sake of security, you should avoid using a banker's card or credit card.*
d) *It is good that modern computer and telephone technology can be used to help solve financial and other forms of crime, even though it does mean an increase in the authorities' supervision of people's lives.*
e) *The authorities are welcome to make decisions that concern me on the basis of the information contained in their registers.*
f) *I am not interested in what information is gathered about me when I am consulting data networks.*

A respondent was assumed to fear a threat to personal privacy if he or she was in agreement with the first three statements and disagreed with the last three. In this way a summed variable was formed which had scores in the range 0–6, so that 0–1 represented the category "no security fears", 2–3 "worried" and 4–6 "security fears". In order to examine changes in this aspect of attitudes toward modern

Table 4.5. *Fears regarding data security among panel participants in 1999 by sum index of fears in 1996*

Security fears in 1999	Security fears in 1996			Total (100%) in 1999
	No fears	Worried	Fearful	
No fears	48	45	7	222
Worried	23	57	20	562
Fearful	9	47	44	325
Total in 1996	264	574	271	1 109

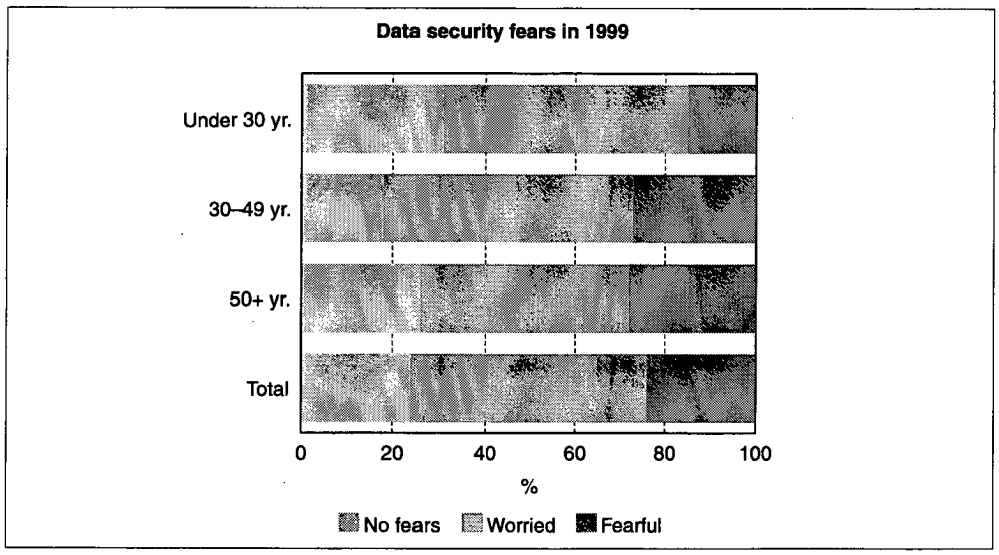


Figure 4.2. *Sum index of fears regarding data security among panel participants in 1999, by age groups*

information technology, summed variables were calculated for both years and compared in order to gain an impression of changes in opinion.

The results indicated that the proportion of respondents who were afraid of the repercussions for personal privacy had increased by about 20% (271 → 325) over the three years and the group who had no such fears had diminished by 15% (264 → 222). Anxiety over data security is thus on the increase, although not appreciably so. The men were considerably less worried about such matters than the women in both years, and the proportion of them who feared breaches of personal privacy had increased by only 10% whereas the figure among the women was 30%.

The respondents under the age of 30 years were much less worried about questions of data security than the older age groups, the proportion having increased most, 30%, among those aged 30–49 years, although the figure was almost as high amongst those aged under 30 years, 25%. The group aged over 50 years had altered least in their opinions over the three years.

In order to reveal changes in the pattern of attitudes towards data security, an anxiety variable was formed which gained the value 0 if the summed variable representing such attitudes was the same in both years, -1 if it was smaller in 1999 than it had been in 1996 and +1 if it was larger in 1999.

As may be seen in Figure 4.3, fears had increased substantially, especially amongst those aged under 30 years, although also in the group aged 30–49 years. There had also been some flow in the opposite direction, however, as even a fifth of the young people had less worries on this score in 1999 than they had had three years earlier and as many as a third in the older age groups had increased their trust in data security systems. The inclusion of sex as a background variable scarcely yields any more precise information, although it may be that the group of women aged 30–40 years contained slightly more people whose security worries had increased than were to be found among the men of the same age. Comparison of the distributions of replies to the basic questions in the non-panel sample failed to reveal any increase in fears except in the responses to the statement "I am not interested in what information is gathered about me when I am consulting data networks." It may nevertheless be concluded in general that fears over personal privacy with respect to data maintained in computerized registers are gradually coming to the fore within the Finnish population, although so far the vast majority of people do not yet feel that their privacy is threatened.

4.4 Attitudes towards the information society

The interviews in both years contained some statements about the information society and its technology that reflected somewhat more concrete opinions than those considered above. We

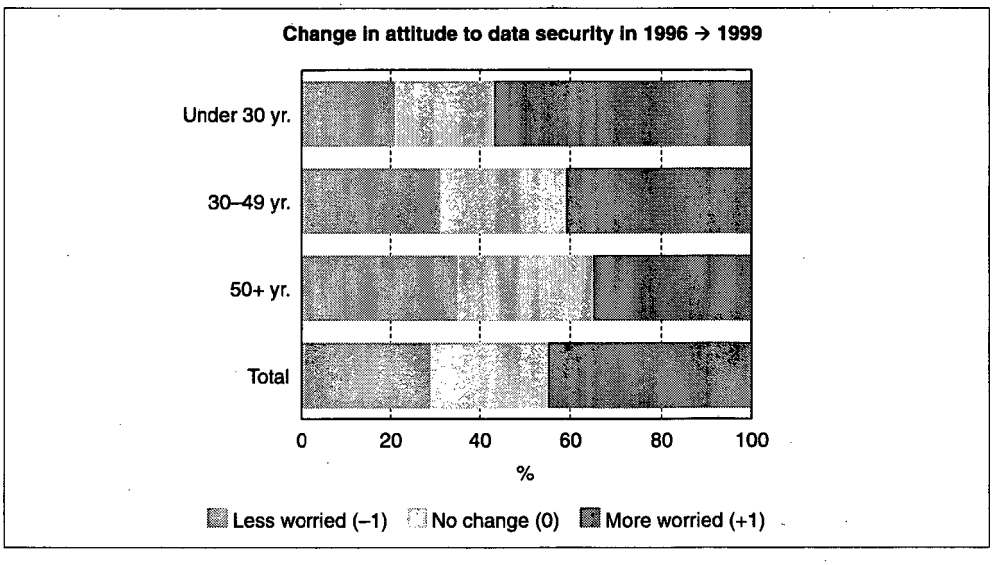


Figure 4.3. *Direction of change in attitude towards data security between 1996 and 1999, by age group, in percentages*

shall look here at changes in attitudes towards these statements separately, operating on two levels: changes in the distributions of responses within groups and changes at the individual level.

The proportion of subjects who were entirely or partly in agreement with the statement *"I feel entirely left behind by the advances made in information technology"* had decreased slightly (39% → 35%), and only 27% of the respondents had altered their basic attitude in this respect. A similar result was obtained from the non-panel comparison, while examination of the changes of opinion at the individual level showed that 49% of the subjects had reacted in exactly the same way as on the previous occasion, 29% had identified less strongly with the statement than earlier and 22% now identified themselves more strongly with it, so that one could certainly not say that the feeling of being left behind by developments had grown in the intervening years. The women had altered their opinions in both directions more often than had the men, but they, too, had tended to turn against the statement. The most clearly divided group of all seemed to be that aged 50 years and over. It was also noticeable that the proportion of all panel members who were in full agreement with the statement had decreased from 17% to 13%.

The proportion of respondents who were entirely or to some extent in agreement with the statement that *"New equipment is being marketed and sold without there being any real use for it"* had increased markedly (61% → 71%), and again the non-panel survey yielded a parallel result. If the permanence of an opinion is to be judged by the number of people who remain in agreement or disagreement with the statement concerned, then it may be said that as many as 66% had remained of the same basic opinion. At the individual level, however, it was seen that 32% agreed with the statement more strongly in 1999 than in 1996 and 21% who had previously been in agreement were now against it. Exactly the same view (choice of the same alternative) was recorded by 47%. The opinions of the men and women did not differ on this matter, and it was in the 30–49 year age group that opinions had altered the least. The respondents had thus become somewhat more critical of the equipment on the market than they had been three years earlier.

Attitudes towards the statement *"New technologies will not help me to save either money or time"* had remained fairly stable, the number of people agreeing with it increasing just slightly (51% → 54%) and as many as 66% of the respondents being of the same opinion as before. Once more the non-panel comparison confirmed this finding, and the movements at the individual level were slightly greater towards agreement than towards disagreement (29% vs. 26%). The under 30-year-old group showed changes of opinion in both directions on this question, but approximately half of the respondents were suspicious of the rational benefits of the new technological devices being introduced. Consumer statistics indicate that expenditure on information technology has increased more than any other category, but the "valued added" achieved in this way must lie in some other sphere rather than practical benefit (Tulot ja kulutus 2000:28).

A very marked change had taken place in reactions to the statement *"New technology creates jobs"*, the proportion of respondents indicating full or partial agreement with it having more than doubled in the three years (21% → 48%), although it must still be said that a half of the Finnish population appear to doubt the employment potential of such technologies. The non-panel comparison again confirmed the above impression, and the examination of changes in opinion at the individual level served well to reveal both the strength of the change and its consistent direction, since as many as 50% of the respondents reacted more favourably in 1999 than they had on the previous occasion while only 14% had adopted a more critical view and just over a third had reacted in exactly the same way as before. The over 50s age group showed very much less change of opinion towards acceptance of this statement than did the younger respondents.

The participants in the panel survey were more than ever convinced that *"The present national television channels are sufficient for me"* (71 % → 85 %), as many as 3/4 of them having preserved their original opinion on this matter. The non-panel survey also

pointed in the same direction, and the changes at the individual level were 31% towards agreement with the statement and only 11% towards disagreement, the majority of the respondents, 58%, remaining entirely of the same opinion on both occasions. One factor that will almost certainly have influenced the results here is that a fourth national television channel had begun operating during the period concerned. A particularly interesting finding, too, was that as many as 48% of the respondents under 30 years of age had converted to approval of this statement, while 73% of those aged over 50 years had remained of the same opinion as earlier. These views do not promise a particularly enthusiastic reception for the new digital TV channels about to be launched.

Opinions regarding the statement *"The present flood of information doesn't worry me"* had remained more or less constant (90% → 88% in agreement). As many as 82% recorded the same basic view on both occasions, but the individual results point to a slight increase in anxiety at the flood of information, in that 23% had changed to disagreement with the statement and only 18% to agreement. One might conclude from this that the flood of information is a problem for only a small minority among the Finnish population. The same number of panel survey participants were in full agreement with the statement on both occasions, i.e. 29 persons, less than 3%, but only five of these were the same individuals. On the other hand, 14 of the people who disagreed with the statement entirely in 1999 had been in full agreement with it in 1996, and even more, 18 persons, had switched opinion entirely in the opposite direction. We may conclude that the feeling of a flood of information is not necessarily a permanent state but may well be linked with particular situations. The feeling certainly seems to have increased more markedly among the population under 50 years of age than in the oldest age group, and the women again appear to have changed opinion in both directions more often than the men, although more often towards disagreement than towards agreement.

No substantial change was recorded in the proportion of respondents agreeing with the statement *"I prefer to organise things by telephone than by post or by computer"* (89% → 85%), but the result could perhaps be interpreted as an increase in support for the information society, i.e. for the use of computer networks. The changes were only minor ones, however, as 84% of the respondents were of the same basic opinion on both occasions. The same very slight drift in favour of conducting business by means other than the telephone was also detectable in the non-panel comparison, but the examination at the individual level served better to highlight the direction of the change, as 25% of the respondents had altered their opinions towards greater disagreement and only 15% towards greater agreement, 60% being of exactly the same opinion on both occasions. The men and women had much the same attitudes, but the subjects who were aged under 50 years had altered their opinions more often than those who were over this age, and more often towards disagreement.

4.5 Summary of changes in opinion

The respondents aged under 30 years had changed their attitudes with relation to new technology much more often than had those in the older age groups, normally becoming more favourably disposed towards it. In fact, the change in their opinions over a period of no more than three years was a quite considerable one, and only their reported interest in technology and its acquisition had remained more or less constant. These changes may have been brought about by social pressures and the power of peer examples. Another clear finding was the difference in opinion between the groups aged under and over 30 years with regard to the statements *"I am more interested in social and cultural affairs than in technology and technical equipment"*, *"I am a do-it-yourself person"* and *"Cheap, simple equipment is good enough for me"*, all three of which were regarded by the younger respondents as applying to them very much less well than earlier. Also, while this younger group within the panel had come to favour more expensive, high quality technical devices, the older age group was more than ever in favour of basic equipment.

The respondents in general had become more optimistic about the future in the course of the

three years, although fears for personal privacy in matters connected with information technology had increased markedly amongst those aged under 30 years and likewise those aged 30–49 years. There was also a flow detectable in the opposite direction, however, since a fifth of even the youngest age group were less worried about data security in 1999 than they had been in 1996, and the same applied to almost a third of the respondents in the older age groups. Thus it may be said that at least for the present, the vast majority of Finnish people do not regard information technology as entailing an infringement of their personal privacy.

The feeling of being "left behind" by advances in information technology can certainly not be said to have increased over the time interval considered here, although it must be admitted that respondents appeared to be less convinced of its practical benefits in many cases, with every second one expressing doubts regarding the rational advantages in terms of savings in time or money. A major change had taken place in attitudes to the statement *"New technology creates jobs"*, with a doubling in the proportion of respondents who were fully or partially in agreement with it (21% → 48%), although the figure still means that a half of the Finnish population do not believe that technology is a creator of employment. Regarding the statement *"The present national television channels are sufficient for me"* the subjects in the panel survey were more unanimous than ever that the national channels were sufficient (71% → 85%), with as many as 3/4 of them being of the same basic opinion as in the earlier survey. This observation does not bode well for the success of the new digital television channels now being planned. Opinions on the statement *"The present flood of information doesn't worry me"* had remained more or less stable (90% → 88% being in agreement), with as many as 82% retaining the same basic opinion as earlier. The changes at the individual level may nevertheless be interpreted as suggesting a slight increase in the feeling of a flood of information, as 23% of the respondents had changed their opinion to oppose the statement while 18% had done so in support of it. It is evident that the flood of information is a problem for only a small number of Finnish people and that it is not normally a permanent problem but is bound to particular situations. The change in the proportion of respondents to whom the statement *"I prefer to organise things by telephone than by post of by computer"* applied was not a large one (89% → 85%), but it may well reflect a slight movement in favour of the information society and the use of data networks. The trend is only a very slight one, however, as 84% of the panel subjects were of the same opinion in both interviews.

5 Consolidation of the mobile phone

We will examine in this chapter the picture given by the present material of the consolidation of the position of the mobile phone as a part of everyday life in Finland. The background to this analysis is provided by the idea of Pantzar, put forward in the Introduction, that like the motor car, the mobile phone "created an opening for itself". In view of the quite unique speed at which the mobile phone has spread, this idea seems a very attractive one (see http://www.stat.fi/tk/el/stty2r1e.html), for if it is true, it should be observable in a change of behaviour in which the economic benefit / high cost of calls relative to the wired phone remains secondary to the various other advantages offered by the mobile phone.

According to the consumer barometer, 88% of Finland's 2.35 million households had at least one mobile phone in January 2001, as opposed to 85% a year earlier and 74% the year before that. In other words 330,000 households had acquired a mobile phone within the last two years, and about 70,000 in the last year. The distribution of the Finnish population aged 15–74 years by possession of one's own mobile phone according to interviews carried out in October 2000 is shown in Figure 5.1.

5.1 Becoming a regular mobile phone user

The percentages quoted in Figure 5.1 are very high, and it is clear that the mobile phone has gained popularity at a furious pace over the last year, especially among the population over 60 years of age. This overall increase in its frequency attracts us to look at how it has consolidated its position as a part of people's everyday lives.

We shall look first at subsequent changes in the situation regarding use of a mobile phone and the opportunities for using one among the participants in the 1996 panel survey. The improved opportunities for using a mobile phone are reflected well in Figure 5.2, which shows that where 44% of these participants belonged to a household which had no mobile phone in 1996, only 13% did so in 1999. In fact the proportion of the population using a mobile phone doubled over the three years in question, and the proportion of people who did not use the mobile phone that their household possessed decreased by a third. Of the almost 500 respondents in 1996 who used the mobile phone in their household, only 10%, or 50 persons, no longer did so in 1999, i.e. it was rare for a person to give up using it.

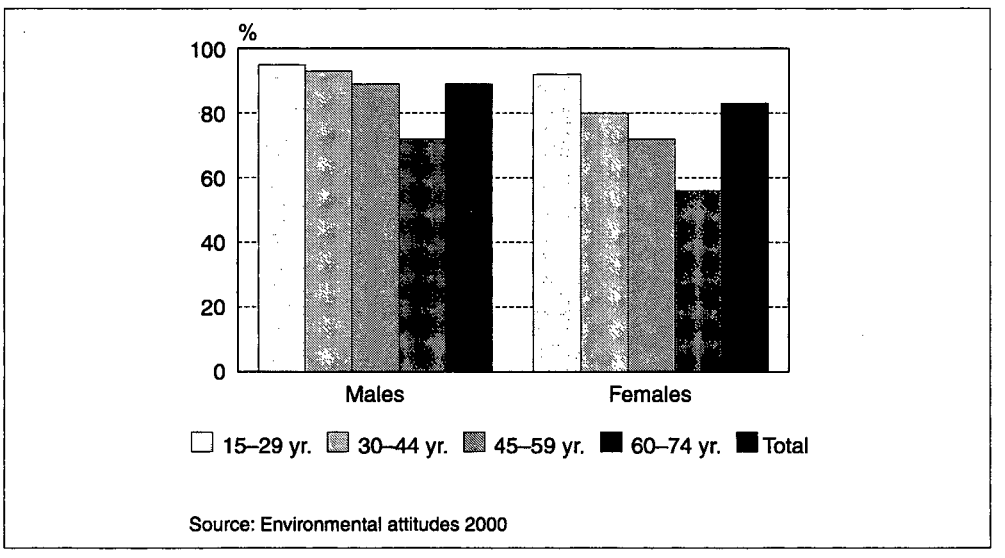


Figure 5.1. *Proportion of the population aged 15–74 years in October 2000 having use of a mobile phone, by age and sex*

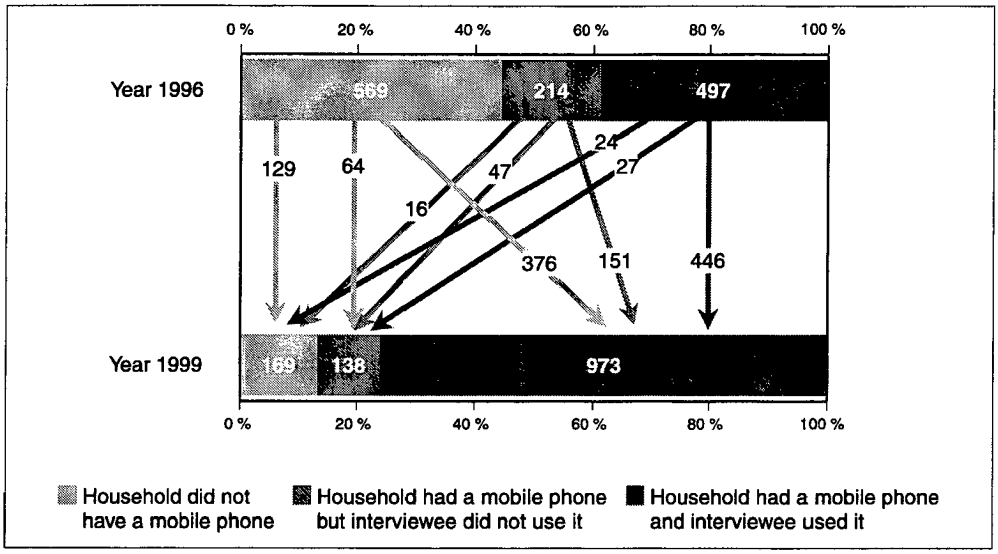


Figure 5.2. *Possibilities for using a mobile phone in 1999, by possibilities in 1996, absolute figures*

As seen in Table 5.1, the largest group among the main users of a mobile phone in 1999 consisted of those who had not used one at all in 1996, while only 7% of the non-users in 1999 had been main or joint users three years earlier and 10% had been occasional users. Likewise, only a small proportion of those who used a mobile phone occasionally or jointly with another person in 1999 had been more active users three years earlier. These data in themselves suffice to show that the mobile phone has become a permanent means of communication for Finnish people and has not remained merely an object of short-term experimentation.

5.2 Mobile phones vs. wired phones

One opportunity for studying the adoption of the mobile phone as a part of everyday life is provided by the questionnaire item asking what proportion of the interviewees' telephone calls were made with a mobile phone. The result was a very clear increase in the proportion of calls from a mobile phone, as 75% of the respondents who had been using one in both years reported in 1999 that they made at least a half of their calls in this way, as compared with 46% in 1996. In fact, as many as 40% said that they used it for virtually all their calls in 1999. Quite a large number of people had left themselves entirely reliant on a mobile phone during this interval. Experience in mobile phone use was evidently of some importance in this, however, as the proportion of calls made on a mobile phone was slightly lower among those who had begun to use one only after 1996, 65% of this group claiming to make at least half of their phone calls in this way and 36% practically all. The difference relative to those who had been using a mobile phone for more than three years was nevertheless not very great. The mobile phone evident fairly soon begins to shape its users' telephone habits.

Further indications of the superior convenience of the mobile phone relative to a wired

Table 5.1. *Intensity of mobile phone use in 1999 relative to that in 1996*

Year 1999	Mobile phone users in 1996 (%)				Total in 1999 (100%)
	Main users	Joint users	Occasional users	Non-users	
Main users	31	7	11	51	770
Joint users	8	18	11	63	100
Occasional users	6	8	14	73	103
Non-users	7	3	7	83	307
Total in 1996	271	91	135	783	1 280

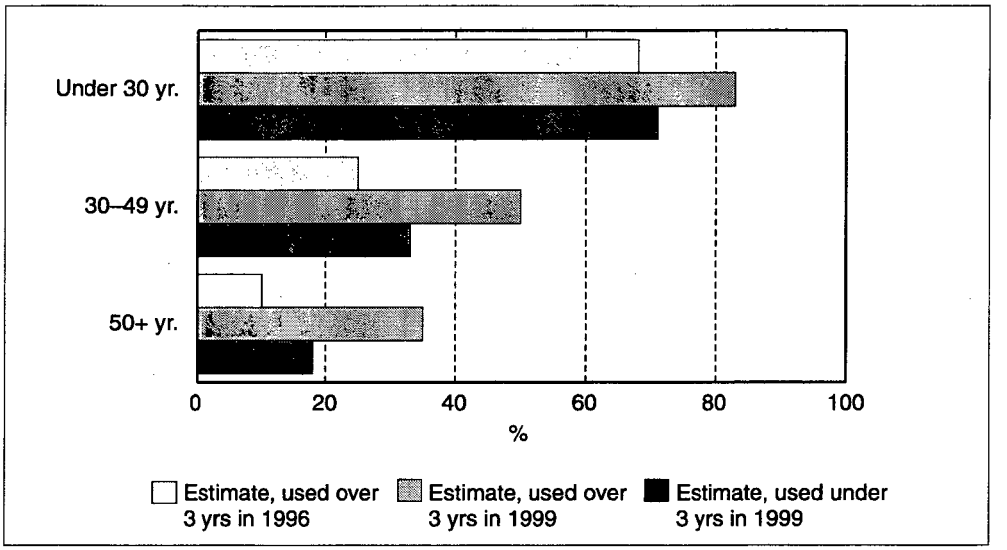


Figure 5.3. *Proportions of persons making at least 2/3 of their phone calls on a mobile phone in 1999, by age and time of having used a mobile phone*

phone were obtained from a comparison of the lengths of calls in the case of respondents who were able to choose between the two. Where almost 50% of the mobile phone users in 1996 reckoned that their calls made in this way were markedly shorter than those made from a wired phone, no more than 31% claimed this by 1999, while a third now reckoned that their calls were equally long with each, as opposed to a fourth of the respondents three years earlier. At the same time, the number reportedly using only a mobile phone grew from 5% to 17% over the same interval. Of those who had begun to use a mobile phone after the first interval, 40% said that their mobile calls were much shorter than their wired calls in 1999, while 24% made calls of equal length on both and 15% now used only a mobile phone. It would thus seem that the greater convenience of the mobile phone induces the user to accept or ignore the higher cost of calls made with it.

It may be concluded from these results that there are no great pressures for reducing the prices of mobile phone calls. It would, in fact, be interesting to study how much a reduction in their prices would affect the numbers of calls made using the ordinary wired network. In the light of the above and of earlier research (Nurmela et al. 2000: 17–18), the numbers of the latter would decrease in all situations where the caller was able to choose between the two.

The female respondents made a substantially smaller proportion of their calls by mobile phone, and more of them made shorter calls than on a wired phone than was the case with the men. The respondents under 30 years of age made a great deal of use of mobile phones and spoke for longer on them than did those in the older age groups, while those aged 50 years or over were still more conscious of the price difference between the two forms of telephone than were those aged 30–49 years.

Increases were recorded in the proportion of calls made by mobile phone over the three years in all the age groups, although there were substantial differences between them (Fig. 5.3).

Clear distinctions between the age groups were observed among the panel subjects who had not yet had a mobile phone in 1996, but the proportions of their calls made with a mobile phone in 1999 continued to be lower than for those who had had a mobile phone for more than three years, although higher than the 1996 figures for the latter group.

Turning now to the differences in length between calls made on mobile and wired phones, we seen in Figure 5.4 the percentages of respondents in each age group who were of the opinion that their mobile phone calls were at least as long as their wired phone calls, detailed separately for 1996 and 1999 for those who had a mobile phone in both years and for 1999 in the case of those who had acquired one in the meantime.

The comparison of lengths of calls points in the same direction as the above analysis, in that the

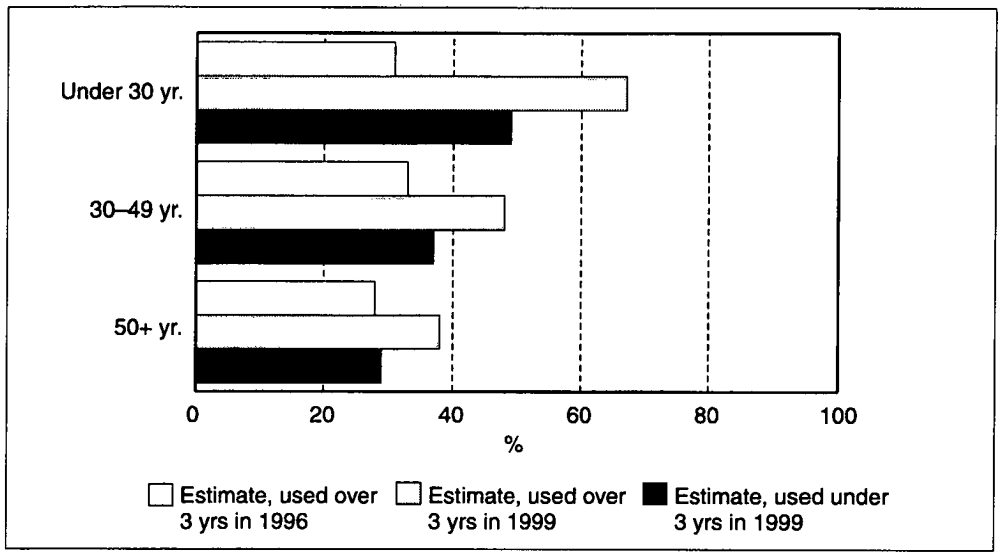


Figure 5.4. *Proportions of persons making at least equally as long phone calls on a mobile phone as on a wired phone in 1999, by age and time of having used a mobile phone*

time for which the subject has possessed a mobile phone has a positive impact on the length of the calls made with it relative to a wired phone. This relation is more pronounced among the respondents aged under 30 years than among the older respondents, and those aged over 50 years are shown to be much more cautious with regard to use of the mobile phone than the younger subjects. It may even be said that the young people exhibit a different behavioural pattern with respect to the mobile phone from those aged over 30 years.

We will look now at changes in the use made of various additional services available by mobile phone, on the assumption that people will take to using an increasing number of such services as time goes by and that their use will become an established habit if they are felt to be of any real benefit.

Table 5.2 provides an interesting picture of the usefulness of certain of these services as far as the user is concerned. In the first place, those interviewees who had already used such services in 1996 were using a wider variety of them and using them more frequently by 1999. The differences in this respect may well be explained by the fact that the group of main users in 1996 contained a higher proportion of persons aged 30–49 years, especially men, than did the group who became mobile phone users later, and that their acquisition of a phone had been more strongly motivated by the concrete benefits to be obtained from it.

Table 5.2. *Use of additional mobile services in 1999 by intensity of use in 1996, as percentages among the user groups*

Use of service in 1999	Main user in 1996		Joint user in 1996	Occasional user in 1996	Non-user in 1996
	Used service in 1996	Did not use service in 1996			
– Storage of numbers in memory*	95	83	87	86	90
– Text messages	95	71	69	80	80
– Return of unanswered calls	82	75	63	78	71
– Answering machine	78	36	32	38	28
– Transfer of calls	72	35	27	42	27
– Hold for enquiry	59	10	10	8	9
– Three-way consultation	0	4	1	0	1
Respondents	244		71	99	451

* Question concerned intercom dialling in1996 and storing of numbers in the memory in 1999, so that the results are not entirely comparable.

Table 5.3. *Use of new mobile services in 1999 by type of mobile phone use in 1996, as percentages among the user groups*

Service in 1999	Main user in 1996	Joint user in 1996	Occasional user in 1996	Non-user in 1996
Call home	46	57	45	46
Connection service	47	29	23	20
Notice of Email message	10	8	5	6
New Email form on screen	9	8	4	5
Payment by mobile phone	6	7	2	2
Sending of group text messages	5	1	1	3
Respondents	244	75	99	452

Secondly, it is seen that the various services differed greatly in popularity. Practically all users took advantage of the possibility to store numbers in the phone's memory, and this was not influenced by the length of time for which the subject had been using a phone. Similarly, the sending of text messages was a highly important function, although this had clearly attained greater popularity among those who had acquired a mobile phone more recently. One explanation may lie in the fact that the time interval in question was one during which large numbers of young people, who are known to be avid senders of such messages, acquired their first mobile phone. The facility allowing the user to phone back to someone whose call remained unanswered has also gained widespread acceptance, but use of the answering service has not. The two previously mentioned facilities, text messages and calling back, in fact partially render an answering service unnecessary. Similarly, relatively little use is made of the call transfer facility by those who have acquired a mobile phone more recently, presumably again because of the ease of calling back if one has been unable to answer. In the same way the need for holding a call while making an enquiry elsewhere has not proved so great that new users have been tempted to learn this facility, any more than has the technique of setting up three-way negotiations.

Some additional information on the effects of long-term use on usage habits may be gained from an analysis of the use made in the various age groups of services that were introduced in the course of the three-year interval (Table 5.3).

Calls home and the connecting service provided by directory enquiries proved the most popular of these later innovations, with the former being used by nearly half the respondents. The connecting service was clearly favoured by those who had been mobile phone users for longest, while group text messages were favoured only by a very small number of experienced mobile phone users. The use of a mobile phone to open one's Email has proved slightly more popular and tends to be favoured by long-standing users, and the same was true of the payment of bills by mobile phone in the 1999 survey.

It would seem from the above analysis that a greater proportion of the main users of a mobile phone in 1996 were prompted to do so on a rational basis, in pursuit of greater efficiency, while the motives of those who acquired one later were more closely connected with questions of social interaction, hence the abundant use made of text messages and the possibility for phoning back when a call has remained unanswered.

5.3 Attitudes towards use of a mobile phone

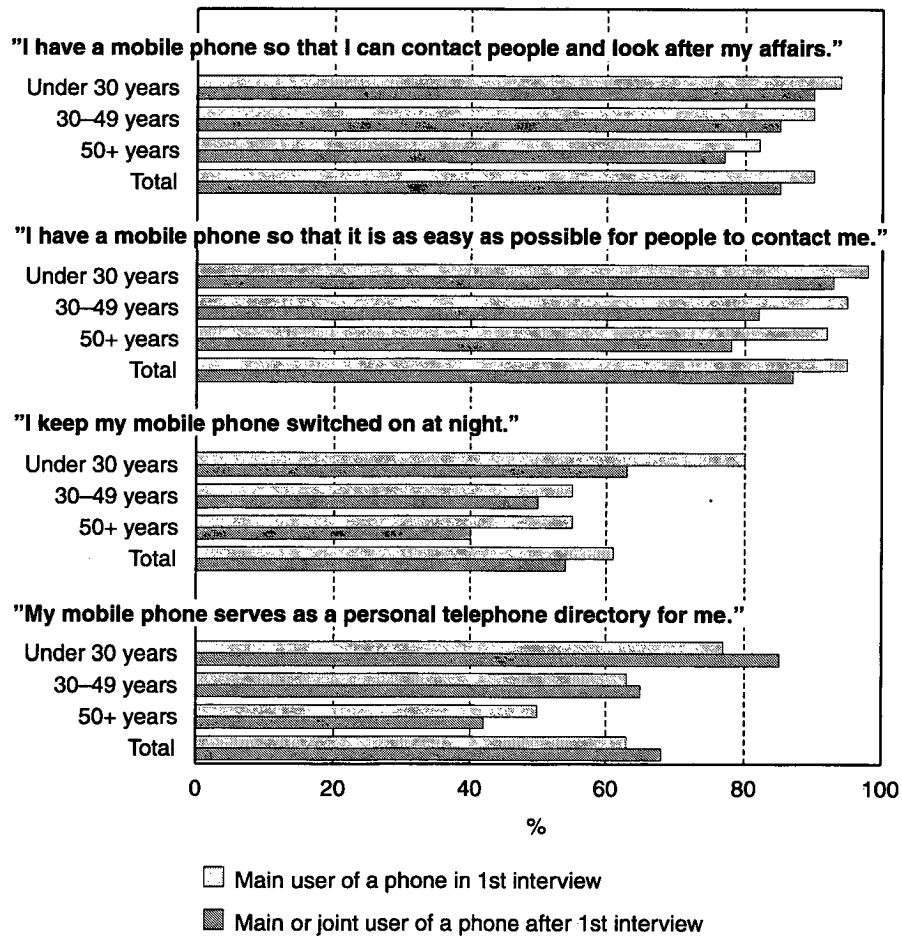
We will now turn our attention to whether any systematic differences may be perceived in the attitudes of people who had used a mobile phone for different lengths of time towards its use, especially when examined in terms of age and sex. Figure 5.5 and Table 5.4 concentrate on two groups, those who were main users at the time of the 1996 interview, and those who had begun to use one at

some time after that and described themselves in the 1999 interview as main users or joint users (the overall proportion of joint users was small, only around 10%). The last three statements listed in the table may have been irrelevant for some of the respondents, e.g. if their mobile phone did not have the functions concerned, if their mobile phone was provided by their employer primarily for work purposes or if the interviewee was not at work etc. so that the distributions of responses to these items may be regarded as no more than indicative of a certain trend.

Both the opportunity afforded by the mobile phone for making a call whenever necessary and the opportunity for being reached by telephone at any time have proved significant features for practically all users, and still more so for those who have been using one for a long time, as reachability appeared to be a somewhat less important factor for those who had been using a mobile phone for only a short time. The women attached slightly less weight to the ability to make a phone call from anywhere at all than did the men, but there was no difference between the sexes in the value placed on reachability.

The respondents who had being using a mobile phone for a longer time were also more inclined to keep it on at night and during their free time, and those aged under 30 years kept their mobile phones switched on at night more frequently than the other age groups. The age group aged 30–49 years placed perhaps slightly more emphasis on ensuring peace during their leisure time than the others. The women who had been using a mobile phone for a long time were more likely than the others to keep

Figure 5.5. *Percentages of respondents considering the given statements on attitudes towards the mobile to represent their own attitudes well or fairly well, by age and use of a mobile phone**



* Persons who were not main users of a mobile phone in 1996 are excluded from the data.

*Table 5.4. Percentages of respondents indicating that the statements on attitudes towards the mobile phone represented their attitudes well or fairly well, by age and duration of mobile phone use**

Statement	Under 30 yr.	30–49 yr.	50+ yr.	Total
I turn my mobile phone off in my free time.				
Main user in 1st interview	33	35	25	32
Became main or joint user after 1st interview	34	43	42	38
The statements below are somewhat ambiguous for reasons connected with the equipment or situation				
The mobile phone is my clock and diary.				
Main user in 1st interview	54	28	16	32
Became main or joint user after 1st interview	43	24	7	29
I relax by playing the games in my mobile phone.				
Main user in 1st interview	6	2	3	3
Became main or joint user after 1st interview	16	2	1	8
I turn my private mobile phone off when at work, although I could keep it on if I wanted.				
Main user in 1st interview	29	28	11	24
Became main or joint user after 1st interview	39	29	19	32

* Mobile phone users in 1996 who were not main users are not included in this table.

it on at night, but were also more prepared to switch it off in their spare time.

In the light of the designers' vision of the mobile phone performing the functions of a small-scale office or a secretary, it is interesting that 2/3 of the respondents used it as a telephone directory, and that those under 30 years of age who had used one for only a short time made particularly widespread use of this property. By contrast, only a half of the respondents aged over 50 years used the memory for storing telephone numbers. The mobile phone also served as a clock and a calendar for about a half of the subjects under 30 years of age, but rarely for people in the other age groups. The men used it for this purpose more often than did the women, however. A very small proportion of respondents used the games available in their mobile phone, even in the under-30 age group.

The distributions of responses indicated in Figure 5.5 and Table 5.4 allow us to draw the cautious conclusion that long-term use of a mobile phone leads to it gradually becoming a more integral part of one's everyday life, although another interpretation would be that those people who acquired one at an early stage had a greater need for it in their lives and that those who took to using one later presumably had rather different motives.

It is possible to look further into the differences in the use made of mobile phones by examining patterns of usage as a function of time of possession. Examination of Table 5.5 allows us to conclude that the newer users were able to adopt the new functions of the mobile phone at the time of acquisition more easily than those people who had already developed firmly established patterns of usage before such functions were introduced. On the other hand, a long experience of mobile phone use can imply a certain routine that is able to override such facts as the cheaper call charges for a wired phone. For some reason, the respondents under 30 years of age were considerably better motivated to use text messages than those aged over 30 years, and this becomes apparent in the panel survey as well, where it is most clearly reflected in the use of these messages for the exchange of gossip. The communicating of actual information by this means did not differ between the under-30 and 30–49-year age groups. The sending of letters and cards can evidently be replaced relatively easily by text messages, and perhaps to some extent by picture messages, or it may even be that the latter develop into a new form of greeting that does not directly oust letters or cards. It seems that little use is made of text messages instead of Email.

Table 5.5. *Percentages of respondents indicating that the given mobile phone habits applied to them, by age and duration of mobile phone use**

Statement	Under 30 yr.	30–49 yr.	50+ yr.	Total
Sent more than 10 messages in last 7 days				
Main user in 1st interview	38	7	0	14
Became main or joint user after 1st interview	47	13	0	27
More messages than phone calls during the autumn				
Main user in 1st interview	24	5	0	9
Became main or joint user after 1st interview	39	14	0	24
Sometimes turns mobile phone to Silent				
Main user in 1st interview	88	61	37	63
Became main or joint user after 1st interview	90	49	21	61
Uses mobile phone for preference				
Main user in 1st interview	58	37	18	38
Became main or joint user after 1st interview	46	24	12	31
Sometimes sends a message rather than writing a letter				
Main user in 1st interview	52	43	21	37
Became main or joint user after 1st interview	67	41	14	51
Sometimes sends a message rather than phoning				
Main user in 1st interview	91	69	57	74
Became main or joint user after 1st interview	96	76	48	88
Sometimes sends a message rather than using Email				
Main user in 1st interview	37	23	10	25
Became main or joint user after 1st interview	36	12	2	23
Used messages for gossiping in the last week				
Main user in 1st interview	63	19	..	40
Became main or joint user after 1st interview	56	30	..	48
Sent information by mobile phone message in the last week				
Main user in 1st interview	84	81	..	81
Became main or joint user after 1st interview	82	83	..	83

* Mobile phone users in 1996 who were not main users are not included in this table.

We may also attempt to appreciate the significance of the duration of mobile phone use and the point in time at which it was adopted for the pattern of its usage by imagining what its future use might be like. As seen in Table 5.6, the most popular of the new ideas for additional services to be made available to users of mobile phones were notification of the arrival of a parcel or packet to be collected from the post office and the ability to open one's Email by mobile phone, while the next level of interest was represented by banking transactions and notification of the expiry of library books. Web browsing came only in fifth place, and somewhat less favoured still was the possibility for receiving letters in electronic form. Only a fifth of the respondents were interested in either ordering goods by mobile phone or paying for an order at once by means of the phone. The respondents who had been using a mobile phone for longer showed a greater interest in opening their Email and receiving notification of the arrival of a parcel at the post office than did those who had used one for a shorter time, and the same was true of banking transactions among those over 30 years of age, while in all the other cases the short-term users showed more interest in the new possibilities than did the more experienced ones. The respondents under 30 years of age showed the most interest in such services in general, and those over 50 years the least interest.

Examination of the results by sex showed that the women were more interested in the majority of new services than were the men (women more interested in 9/16 services, men more interested in

Table 5.6. *Percentages of respondents indicating that the given mobile function or service would be of either moderate or great interest to them, by age and duration of mobile phone use**

Statement	Under 30 yr.	30–49 yr.	50+ yr.	Total
Internet www browsing				
Main user in 1st interview	59	42	21	41
Became main or joint user after 1st interview	64	34	19	44
Banking by mobile phone				
Main user in 1st interview	64	58	40	55
Became main or joint user after 1st interview	68	40	24	52
Shopping by mobile phone				
Main user in 1st interview	17	12	5	11
Became main or joint user after 1st interview	27	11	4	17
Payment of goods by mobile phone at time of ordering				
Main user in 1st interview	27	16	8	17
Became main or joint user after 1st interview	29	15	7	20
Opening of Email by mobile phone				
Main user in 1st interview	80	84	39	62
Became main or joint user after 1st interview	77	49	17	55
Letters in electronic form by mobile phone				
Main user in 1st interview	53	39	21	39
Became main or joint user after 1st interview	46	35	8	35
Notice of arrival of postal package by mobile phone				
Main user in 1st interview	84	66	47	56
Became main or joint user after 1st interview	81	60	34	64
Notice of expiry of library books by mobile phone				
Main user in 1st interview	72	48	27	50
Became main or joint user after 1st interview	73	48	24	54

* Mobile phone users in 1996 who were not main users are not included in this table.

4/16 and both equally interested in 3/16). The difference was especially clear in the case of notification of the expiry of a library book, and the women were also notably more interested in using a mobile phone to open their Email.

In summary, it may be said that the young people and the women were more interested in the new types of services to be obtained via a mobile phone than were the men or those over 30 years of age. The women were most interested in services that contributed to the "logistics" of everyday life. It was also the case that those who had been using a mobile phone for a long time were more interested in such services than those who had recently begun to use one. The making of purchases by mobile phone was of interest only to a few of the young respondents.

5.4 Does the mobile phone build up its own operating environment?

We will close this discussion of mobile phones by considering whether its status with Finnish users is beginning to take on features suggesting that it is creating a favourable selective environment for itself in the sense referred to in the quotation from Pantzar put forward in the Introduction: "Actors create through their own actions a macro-environment which increasingly imposes conditions on them, so that as the process advances, the original actors are increasingly obliged to subordinate themselves to the logic of the entity as a whole and begin to act in an ever more predictable manner."

Three interesting facts relevant to this question emerged in the discussion above:

Firstly, the mobile phone appears to establish itself more firmly than ever as a part of its user's daily life as time goes by. Many technical devices have come onto the market over the years which have aroused much enthusiasm at first but have failed to find a regular place in people's everyday routines. Perhaps the best example of this is the breadmaker. Examples of transient pieces of equipment meant to be used by one person only can be found, for example, in games intended for young people or children. No saturation of the demand is to be perceived in the case of the mobile phone, however. On the contrary, new modes of usage are emerging all the time.

Secondly, the motives for acquiring a mobile phone would seem to obey the benefit rule of innovation theory, in the sense that those people who were already using one in 1996 justified this in terms of usefulness and efficiency to a greater extent than those who took to using one later.

Thirdly, is would seem that the principal determinants of the functions of a mobile phone which an individual uses regularly are the range of functions available at the time of acquisition of one's first phone and the social reference group to which the new user belongs. Conversely, users who have already established a routine will not readily explore new functions or services. This barrier poses a challenge for the marketers of new mobile phone functions and services in a situation such as that prevailing in Finland, where there are only a small number of potential new users and many people have had time to established a very firm routine in the use they make of the device.

On the basis of these observations it may indeed be claimed that the mobile phone has at least to some extent succeeded in adapting the behaviour of the Finnish public in a direction which favours the strengthening of its own position. It should be remembered, however, that the mobile phone is in reality an "inanimate" object that has no will of its own and is incapable of directing anything. We are concerned here with a complex system within which designers, operators, users and many others are acting according to their own will. Since a considerable proportion of these people have in practice had parallel objectives, selection environments that are favourable to the mobile phone have begun to emerge.

6 Maturity in computer use and computing skills

This chapter will be concerned with changes in skills relevant to the use of computers and software over the three years. Although the adoption of computers and network connections has proceeded at a slower rate than that of the mobile phone, a steady increase can be observed over the three-year interval examined here (http://www.tilastokeskus.fi/tk/el/stty2r1e.html). Thus there are good grounds for investigating changes in the use of these on the part of the subjects included in the panel survey and for attempting to assess whether the duration of computer use has any effect on the user's habits and skills. The panel participants were divided into two groups for this purpose: those who had been using a computer in 1996 and those who had begun using one in the interim. This provides a good opportunity to test whether those who had begun earlier had achieved better skills and a more extensive range of them than those who had taken it up later.

6.1 Command of basic computing skills

Where 42% of the panel members in 1996 had never used a computer at all, the figure had dropped only to 38% by 1999, i.e. 540 → 489 respondents, suggesting that the number of people having at least something to do with computers is growing only very gradually, in fact extremely slowly by comparison with the rise in the number of mobile phone users in the same panel. Conversely, while only 4% of the panel subjects had given up using a mobile phone in the three-year interval, as many as 15% had given up using a computer. This basic comparison already serves to demonstrate that adoption of the computer as an innovation is a much more complex matter than adoption of the mobile phone. In the first place, the computer being a relatively expensive and bulky, non-personal device, the opportunity to use one is dependent more on factors external to the actual user than is the case with the mobile phone, and since in addition to this multifarious operating environment the individual also needs a fair degree of motivation in order to learn to use a computer, it is quite understandable that adoption of both the device itself and the network connections that go with it has proceeded slowly.

Let us begin the examination proper by looking at the respondents' own evaluations of their computing skills. As we may expect, those who had begun using a computer before 1996 had improved their skills by 1999 (Table 6.1). Every second respondent had improved in the ability to copy material from the Internet, and one in four claimed to be more skilful in the use of a mouse and a keyboard than earlier. The slowest advances were made in abilities to load and update programs.

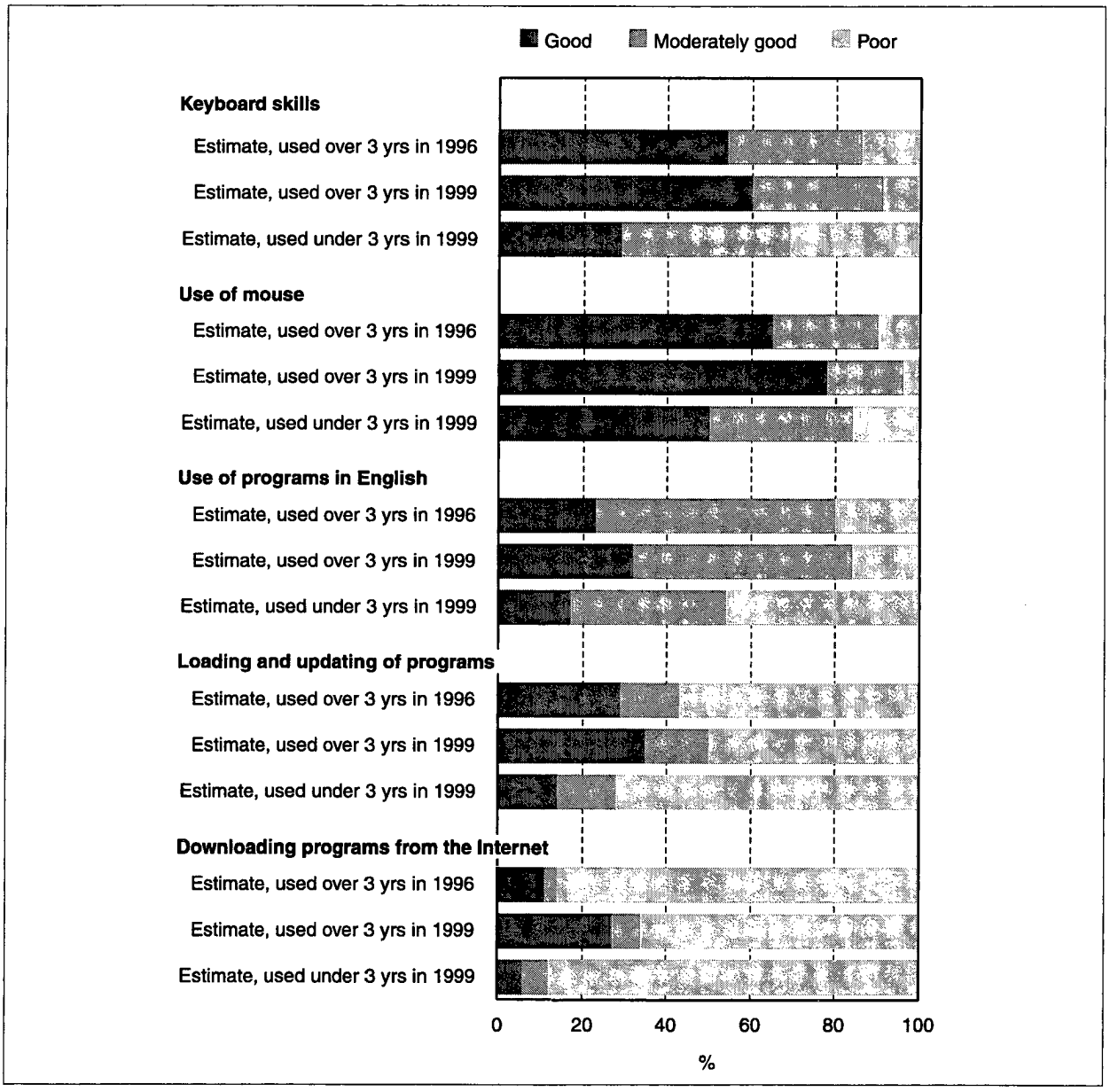
Since Figure 6.1 is based on the respondents' own evaluations of their skills, it is open to many interpretations, depending on what they compare their skills with. It is probable, of course, that a respondent may have had many more points of comparison in matters of computer use within his immediate environment in 1999 than was the case in 1996, so that the self-evaluation may have been more critical than in the first interview. This may also partly explain why the skills possessed by the new users in 1999 would seem to be particularly

Table 6.1. *Improvement in basic computing skills between 1996 and 1999, percentages of those using a computer in 1996*

Basic computing skills	%
Downloading programs from the Internet	52
Use of programs in English	33
Keyboard skills	26
Use of mouse	22
Loading and updating of programs	19

poor relative to those of the subjects who had been using a computer for more than three years. In the case of the loading of programs and their downloading from the net, for instance, it may be conjectured that the early users had more of a "pioneer spirit" and were more prepared to set up their machine from first principles than those who came into computing later. The latter, on the other hand, were presented with "a table that was already laid", i.e. they were placed in front of a computer in which the necessary programs had already been installed, so that some of the skills mentioned in the figure were in effect unnecessary. The problem of the programs being in English, for instance, obviously becomes a more serious barrier the more widespread the use of computers becomes in the community. On the other hand, the difference in subjective skills between the old and new users may partly be explained by the very fact that the new users compare themselves with the old ones, whereupon their skills may seem to be poorer than they really are. Also, a higher proportion of the new users were elderly people and women than in the case of the 1996 users. Even in the light of these alleviating factors, however, the gap in computing skills between those using a computer for a long and short period of time still seems disturbingly large.

Figure 6.1. *Basic computing skills in 1996 and 1999, percentage distribution, by duration of computer use as of 1999*



6.2 Changes in the command of computer software

We will now turn our attention to the respondents' reported command of computer software (Figure 6.2, Table 6.2). The questionnaire items concerned are those in which the respondents were asked to evaluate their own skills on a scale of good – moderately good – poor – not used at all. As in the previous section, of course, the respondents' estimates regarding their own skills are dependent on the situation in each case, perhaps the most significant factors being the level of skills possessed in the respondent's immediate circles at home, at work or at a place of study and the numbers of operations or functions that have to be learned in the software concerned. The majority of them will presumably have gained more computer users in their immediate circle of friends or colleagues over the three years in question, and all programs will have become much more complex in terms of the operations and functions that have to be mastered, so that again the standards with which they will have been comparing themselves in 1999 will probably have been higher than in 1996. It is also conceivable that these factors may have been of greater significance in the case of software than in the above examination of basic skills.

Figure 6.2. *Ability to use given computer programs in 1996 and 1999, percentage distribution, by duration of computer use as of 1999*

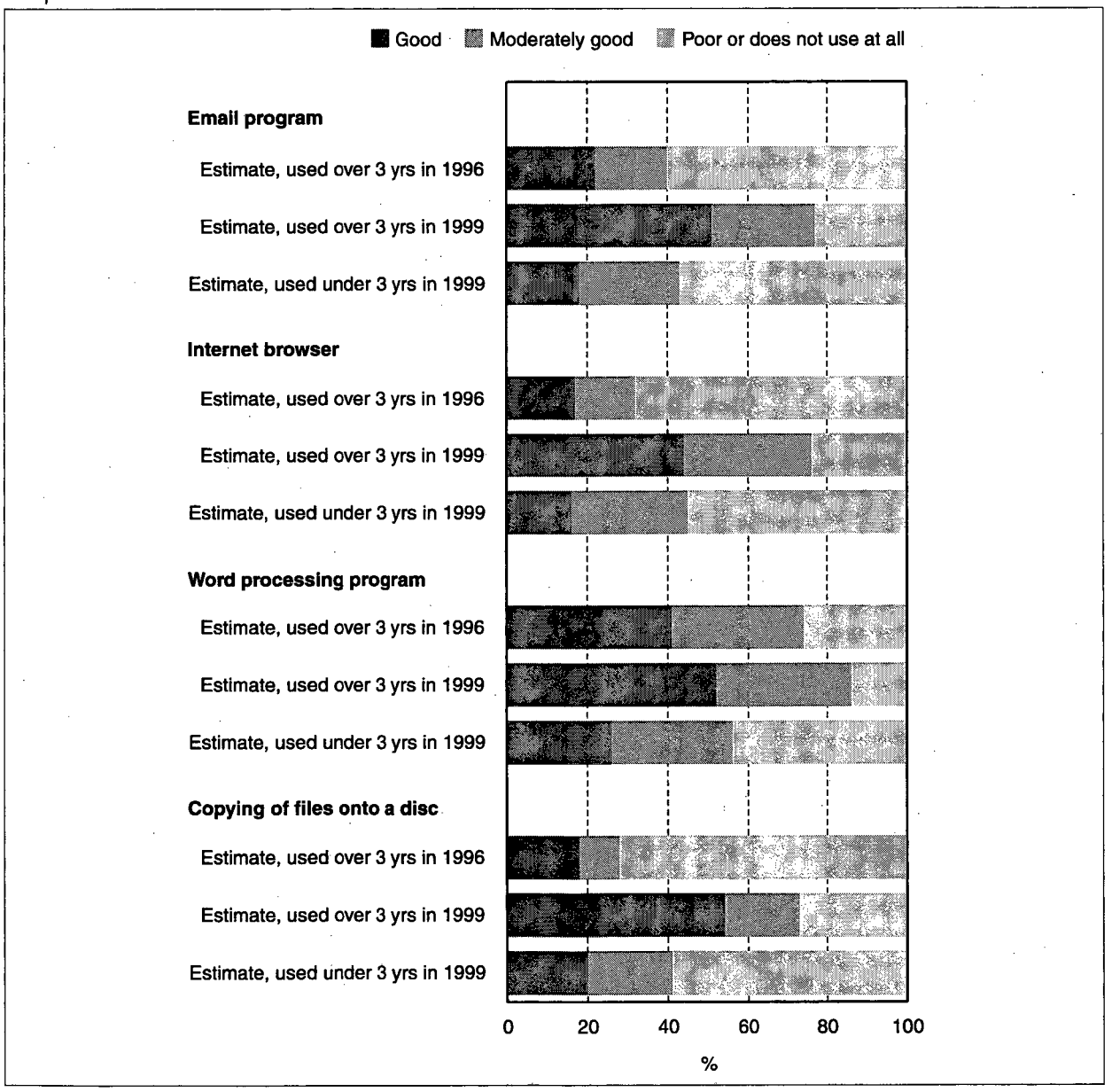


Table 6.2. *Ability to use given computer programs in 1996 and 1999, percentages, by duration of computer use as of 1999*

Program	Well, %		Moderately well, %		Poorly or not at all, %		Total
	1996	1999	1996	1999	1996	1999	
Graphics program							
Used for at least 3 years	27	28	32	33	39	40	653
Used for less than 3 years		10		24		66	150
Spreadsheet program							
Used for at least 3 years	16	23	27	32	57	45	653
Used for less than 3 years		5		23		72	150
Database program							
Used for at least 3 years	10	14	18	23	71	62	653
Used for less than 3 years		5		16		79	150
Desktop publishing program							
Used for at least 3 years	4	5	6	11	90	83	653
Used for less than 3 years		1		5		94	150
Image processing program							
Used for at least 3 years		15		24		61	653
Used for less than 3 years		5		15		80	150
Internet banking facility							
Used for at least 3 years		33		10		57	653
Used for less than 3 years		18		11		71	150

Comparison of the respondents' reported skills in the two years points to a considerable improvement at the personal level. Both use of a browsing program and the ability to copy a file onto a disc were mastered better by over 60% of the respondents in 1999, and almost as many (56%) had improved in their ability to use the Email. About a third reckoned that their word processing skills had increased in the interval, and similar figures were recorded for spreadsheet and database programs, whereas the least improvement was seen in the use of graphics and desktop publishing programs, affecting only about one respondent in every four. More women than men had improved their software skills, with the exception of database and desktop publishing programs.

Examined in terms of age, the youngest group, under 30 years, had improved their skills more often than had those aged 30–49 years or 50 years and over, while the latter had developed in much the same way, with the only differences in favour of the former being seen in graphics and desktop publishing. In fact, it may be said that in general no one was particularly interested in simple graphics programs, possibly because it is too simple a tool for true self-expression. It has been shown earlier, in 1991, that only about 10% of Finns indulged in painting or drawing as means of expressing themselves (SVT. Kuttuuri ja viestintä 1993:3, table 5), and even these people are unlikely to be attracted by graphics programs, as they are highly primitive by comparison with traditional techniques. Others, in turn, may find it still more difficult to find suitable uses for a computer graphics program.

Comparisons between those who had been using a computer in 1996 and those who began using one after that first interview are presented in Table 6.2 and Figure 6.2. The former group had been asked about their software skills in both interviews and the latter only in the second, with the exception of the items concerned with image processing and Internet banking, which were included in the 1999 questionnaire for the first time. The outcome is clear, that the group who had begun using a computer since 1996 were systematically substantially poorer at using all the programs mentioned

than those who had been using one for at least three years. It was only in connection with Email programs, Internet browsers and the copying of files onto a disc that the new users reached even the level of skill reported by the more long-established users on the first occasion. It is difficult to explain a difference of this magnitude.

It is astonishing that the new users of a computer should have rated their software skills so much lower than did the respondents who had been using one for more than three years. The explanation may lie in the fact that they were comparing their own skills with those of a reference group that included a higher percentage of computer users than was the case for the 1996 group and that at the same time the programs had become larger and more complex. Further reasons may also be found in these people's needs and motives. Among the long-term computer users, the young people had improved their software skills substantially more than had those aged 30 years or over, and this young age group can justifiably be regarded as better motivated towards computer use.

There were considerably less people with a good command of image processing and Internet banking among the new users than among the long-standing ones, and in this respect it may be maintained that the pattern observed in mobile phone use whereby the time of adopting the innovation affected the manner in which it was used certainly did not apply to the adoption of new computer programs, at least not nearly so clearly. The differences as far as the newer network services were concerned, e.g. electronic forms, E-commerce, listening to the radio via a computer network, Internet telephone calls, network study courses, virtual games played with another subscriber and downloading of mp3 files from the network, were very much of the same kind, the long-standing users having experimented with them more often and having become more frequent users of them than the non-panel subjects on average, while the late adopters used them to a lesser degree still.

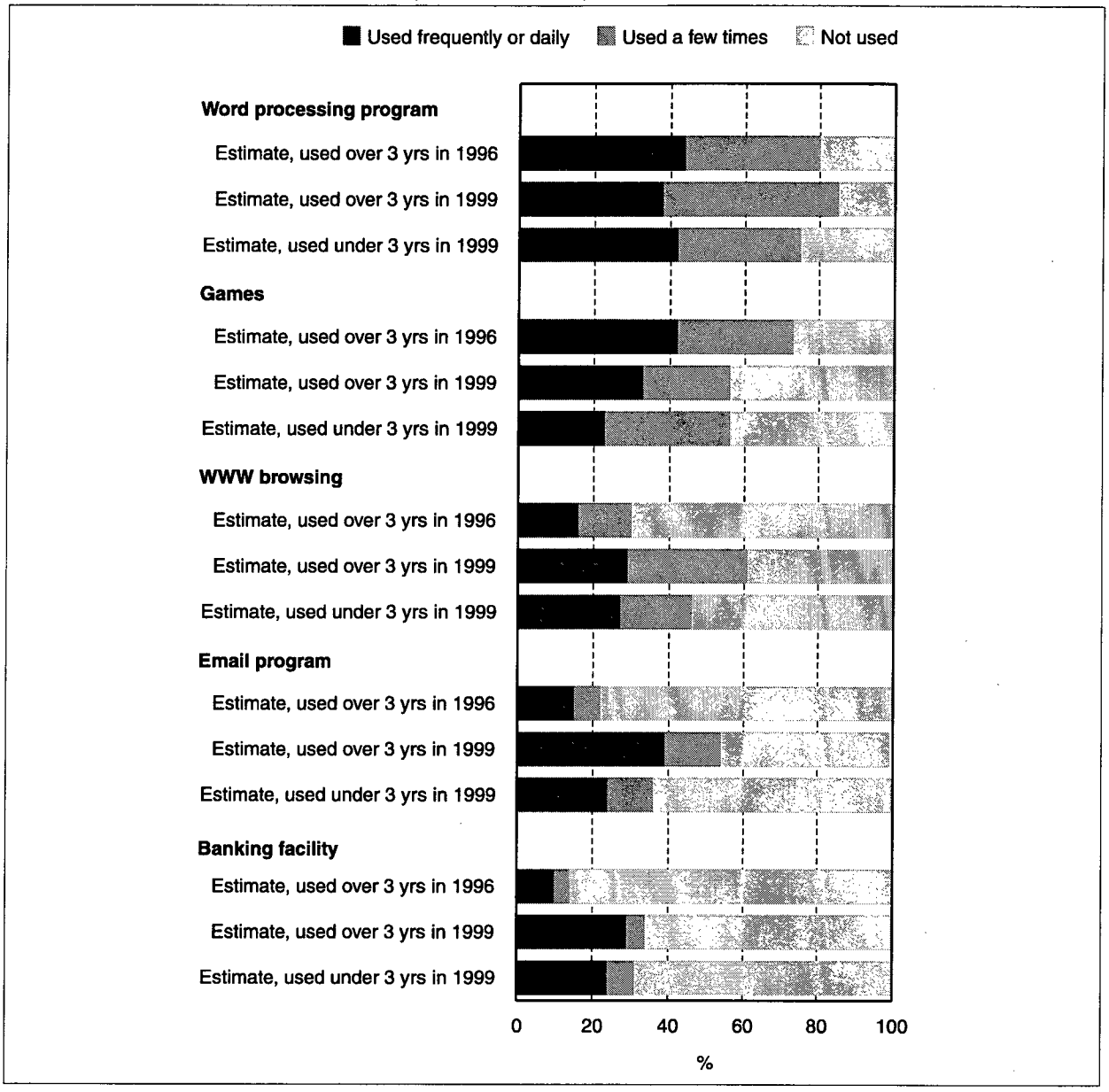
The differences between the long-term and short-term users revealed by Table 6.2 and Figure 6.2 also raise the issue of marginalisation. It is easy to imagine that the short-term users might be in general more clumsy or less skilful with their computer, or that they had not found a suitable and rewarding role for computer use in their own lives, so that their mastery of the necessary software had remained superficial. We will attempt in the discussion below to work out which of these explanations is the more applicable.

One means of explaining the difference in software ability may lie in the amount of use made of the computer. Comparison of the home use of computers by the two groups indicates that as many as 63% of the long-standing group used a computer at home at least once a week, as opposed to only 41% of the recent adopters, whereas only 10% of them never used a computer at home, as opposed to 34% of the latter group. Likewise 37% of the long-term users had an Internet connection at home, but only 20% of the short-term users. On the other hand, the same proportion of those who had an Internet connection at home actually used it in both groups. There was also a very great difference in the use of a computer at work between the long-term and short-term users, since as many as 77% of the latter replied that they did not use a computer at work, whereas 53% of the former had a computer of their own at work and only 16% reported that their work did not involve the use of a PC at all.

The above data on the amount of use made of a computer and the situations in which it is used already serve to explain the differences between the long-standing and recent adopters, at least to a significant extent. Those who have adopted the innovation only recently simply do not have the need to use a computer or the Internet, or the opportunity to do so, by any means as often as the long-term users. In this sense one certainly could not speak at all vociferously of marginalisation, if this is to be interpreted as retreat in the face of new technology.

Further information on factors connected with computer use is to be obtained from Table 6.3 and Figure 6.3, which show first of all that only the use of Email increased in the intervening three years among the people who had been using a computer for more than that time, while the number of re-

Figure 6.3. *Frequency of home use of a computer over the last three months in 1996 and 1999, percentages of those who used a home computer at all, by duration of computer use as of 1999*



spondents in that group who played computer games daily or relatively often had decreased markedly. The number of non-users of Email and web browsers had diminished by almost a half, and the number of respondents who had not played computer games at all in the preceding three months had increased. The most firmly established mode of computer use was word processing, which had been used at least a couple of times in recent months by 85% of the long-term computer users. The number of daily or at least very frequent users had grown very markedly in the case of Email and Internet banking, whereas regular web browsing had increased only slightly.

The most natural conclusion to be drawn from these data on home computer use is that the intensity of use does not increase greatly after the initial adoption phase. Apart from word processing, only use of the Internet has gained an established place in home use, but even these programs were used daily or reasonably frequently by only a minority of the respondents. The commodities and entertainments offered by computer programs have not gained a widely established position in Finnish homes, not even among those who have been using a computer for more than three years.

Table 6.3 and Figure 6.3 also contain information on the motives of the new computer users. Al-

Table 6.3. *Frequency of home use of given computer programs over the last three months in 1996 and 1999, percentages of all users of a home computer, by duration and frequency of computer use as of 1999*

Computer program	Used frequently or daily		Used a few times		Not used		Total
	1996	1999	1996	1999	1996	1999	
Graphics/Desktop publishing program							
Used for at least 3 years	14	18	17	21	69	61	337
Used for less than 3 years		10		20		70	244
Study program							
Used for at least 3 years	17	9	13	16	71	74	337
Used for less than 3 years		7		13		80	244
Bulletin board							
Used for at least 3 years	4	6	5	8	91	85	337
Used for less than 3 years		0		6		93	244

though they ranked their own computer skills at a very much lower level than the longer-standing users, their frequency of use differed very little from that reported by the latter in the case of word processing, computer games and, surprisingly, Internet banking. The difference was slightly larger where web browsing and Email were concerned, but none of the programs yielded a marked difference in the regularity of use between these groups. Home computer use provides, at least in principle, a good opportunity to try out programs, and in this way their frequency of use can increase among more recent adopters as well. It may well be that several years of experimentation are required before the user feels confident about mastering the computer and its software.

7 Information society capabilities at work

It is often claimed that work is altering constantly and at a hectic pace, so that they have to be learning new things all the time. Particular attention is often paid to the essential nature of interactive skills in the context of these changes. We shall look here at the use of the telephone, computer, Email and Internet at work in the light of the panel survey, which allows us to assess how the changes in working methods at the individual level correspond to the interpretations given to them in public discussions.

7.1 The telephone as communication tool at work

It may be said on the basis of Table 7.1 that the telephone did not alter in importance as far as people's work was concerned during the three-year interval studied here. Even the respondents who had begun work after 1996 used the telephone practically as much as those who have been at work longer, or perhaps just slightly less. On the other hand, when the respondents were asked whether they had a mobile phone at work as well as or instead of a wired phone, it became clear that the number who had one had greatly increased among those who had been working for longer (38% → 47%), whereas only 35% of those who had recently started work used a mobile phone there.

The on-going change in working methods referred to as networking may be assumed to increase the numbers of contacts to be made in the course of many people's work, and if this holds good one may expect the numbers of telephone calls to increase. In considering how this has affected use of the telephone by the subjects in the panel survey, we may observe first of all that even comparison of the non-panel results with the situation in 1996 suggests that what changes may have taken place were only minor ones. Table 7.2 provides a similar result for the panel itself, indicating a drop rather than a rise in the proportion of people making a large number of phone calls at work and very much less frequent use of the phone by those who began work after 1996 than among those who had been at work for longer. A slight reduction in use also emerges at the individual level, as 36% of the respondents reckoned that they made less telephone calls in 1999 than they had in 1996 whereas only 29% claimed that they made more, with 36% making approximately the same number. Thus networking within industry and commerce cannot be said to have led to any great expansion in the use of the telephone, at least, although it may well be reflected in the use of Email.

***Table 7.1** Use of the telephone at work in 1996 and 1999, percentages, by length of working career*

Use of telephone at work	At work in 1996		Began work after 1996
	1996	1999	1999
Work based mostly on use of the telephone.	2	2	3
More than half of working time spent on the telephone	2	2	2
Telephone an essential part of work, but does not take up the majority of the time	32	32	20
Telephone important for maintaining contacts.	24	23	20
Telephone used occasionally.	26	26	31
Telephone unnecessary.	12	12	15
Impossible to say (e.g. at work so long ago)	3	2	6
Total respondents (100%)	638	638	104

Table 7.2. Numbers of telephone calls made and received, percentage distribution among those at work in 1996 and those who began work later

	At work in 1996		Began work after 1996
	1996	1999	1999
Phone calls received			
More than 30 per week	41	36	15
20–29 per week	9	15	6
10–19 per week	11	12	18
Less than 10 per week	23	23	30
Less than 1 per week	14	13	29
Phone calls made			
More than 30 per week	33	30	15
20–29 per week	11	15	8
10–19 per week	17	18	19
Less than 10 per week	24	27	36
Less than 1 per week	13	10	22
Total respondents	528	528	136

7.2. The computer, Email and Internet at work

One could very well assume that the advance towards an information society would be seen particularly clearly in the use of the computer, Email and Internet at work, and it is therefore interesting to examine how the panel subjects behaved with regard to these forms of technology.

No very marked changes were recorded in the use of computers at work over the three years in question (Table 7.3), although the proportion having a computer of their own at work increased somewhat (29% → 35% and the proportion not using a computer at all decreased (45% → 40%). The proportion sharing a computer with others remained the same. Of those who started work after 1996, a half were in jobs where they did not use a computer at all and only just over a fifth had a computer of their own. At least this material

Table 7.3. Opportunities to use a computer at work in 1996 and 1996, percentages

1996	1999				Total (100%)
	No computer	Computer shared among several people	Computer shared with one other person	Own computer	
Not at work in 1996	49	14	8	27	113
At work in 1996 total, of whom:	40	17	8	35	634
No computer	77	11	1	6	45 %
Computer shared among several people	13	49	17	21	19 %
Computer shared with one other person	14	30	20	36	7 %
Own computer	5	3	4	88	29 %

Table 7.4. Availability of Email at work, in 1996 and 1999, percentages, by situation in 1996

Situation in 1996	Email at work	
	1996	1999
No computer at work (N = 294)	0	14
Computer shared among several people (N = 122)	26	45
Computer shared with one other person (N = 45)	40	62
Own computer at work (N = 184)	64	86
Not at work in 1996 (N = 110)	0	40

Table 7.5. *Use of Email and the Internet at work, percentages, by duration of working career*

Use of Email and Internet (numbers of respondents from which percentages are calculated)	Respondents	At work in 1996		Began work after 1996
		1996	1999	1999* (N = 185)
Belonged to employer's Email system	(733)	30	43	51
Used Email for internal communications as much as or more telephone	(181)	36	51	35
Used Email for external communications	(187)	79	94	91
Used Email for external communications as much as or more telephone	(97)	34	80	33
Able to access www from work	(97)	86	97	94
Used Internet frequently for obtaining information	(82)	32	63	46
Used Internet frequently to follow news and newsapers	(82)	15	25	15
Used Internet entertainment and leisure pages frequently	(82)	10	5	2
Used Internet chat pages frequently	(82)	3	2	3
Used Internet frequently for banking	(82)	–	32	24
Used Internet frequently for E-commerce	(82)	–	7	0
Checked incoming Email daily	(105)	80	87	69 (N = 279)

* Includes students

would suggest that the adoption of computers at work was increasing very slowly at the end of the last decade, by about 2 percentage points a year. Of those who had taken up work after 1996, only about a third had had the opportunity to use a computer, either alone or shared with another person, and if this conforms to the general situation at work, as the non-panel results would appear to suggest, then one cannot pin many hopes for the spread of the information society on learning at work.

As far as Email was concerned, it may be said that opportunities to use it increased among the panel respondents with the proportion of persons having a computer of their own at work. It was only under these conditions that almost all the respondents had Email facilities (86%), whereas all in all, only 46% of the employed population had access to Email in 1999 (Table 7.4).

Table 7.5 provides an indication of how the network communication habits of those who were Internet users in 1996 had altered over the three years and how those that came to use it in the meantime through their work or studies behaved in that respect in 1999. The most significant finding was that Email was used much more frequently instead of the telephone for external communication in 1999 than in 1996. A second clear change was that the Internet was progressively more often being used as a source of information. Little use was in fact made of the Internet at work for any other purpose. In the case of Email the sender can be more confident than ever that the message will be read the same day, which means that it serves well as a substitute for the telephone. The functions for which those who had gained access to the Internet since 1996 through their work or studies used this facility were fairly similar to those for which the respondents who had such a connection in 1996 were using it at that time.

The majority of the panel participants who used Email facilities at work sent less than 10 messages a day and received slightly more than this number, with only 5–7% of such respondents sending and receiving more than 100 messages a

Table 7.6. *Email messages sent and received by participants in the panel survey during the working week in 1999*

Email messages	In a working week	
	Received, %	Sent, %
Less than 10	38	51
10–50	40	35
50–100	14	8
100–200	6	3
More than 200	1	2
Total respondents	302	302

week. One may regard this latter group as suffering from a certain flood of communication, but it must be remembered that their use of the telephone may well have decreased by something like the same amount. The proportion of non-panel respondents who received more than 100 Emails a week was still smaller.

It may be concluded from the above examination of the penetration of the information society into everyday working life that the use of modern technology at work is indeed continuing to expand but that the changes are no longer, or in some cases not yet, particularly rapid ones. It is impossible to determine from the present data whether computers and network connections are now in use in most of the jobs for which they would be justified or whether there are still many places of work where their use would lead to substantial improvements in efficiency. Further developments in information and communications technology as such can nevertheless be expected to make the introduction of these facilities possible in a still wider range of circumstances.

Email and information searches via the Internet have increased in their frequency of use to the point of becoming matters of routine, and in this respect, at least, one can speak of the continual penetration of information society technologies and procedures into the workplace wherever jobs are amenable to their adoption.

The changes observed in the use of modern information technology and electronic networks can be summarized very briefly as follows:

a) The skills and abilities of the new users were very much poorer than those of the respondents who had been using a computer in 1996. One reason for this was that they used the new technology less frequently and had a more restricted need for it, so that their skills will not have developed in the same way. It may be assumed that those who were using a computer in 1996 had adopted it in order to make their work more efficient. A computer is, after all, a relatively expensive acquisition, the justifications for which must often at least make mention of benefits to be attained in terms of efficiency.
b) Use of the telephone at work did not increase over the three years.
c) Email has become a significant means of communication at work and can be assumed to replace the telephone in many instances.
d) Much less use was made of computer programs than of mobile phones. The computer and the "services" it provides play a more limited role in the life of the user than does the mobile phone and are more strictly confined to the sphere of work. In this sense it would seem that, at least for the moment, the computer has not succeeded in shaping a selective environment that is favourable for its further dissemination to the same significant extent as has the mobile phone, which may be looked on as competing with the Internet for potential users. Home pages and electronic communication between companies would appear to be growing in importance at a rapid rate in the commercial sphere (SVT; science, technology and research 2000:2), and here we may well talk of a fair degree of shaping of the selective environment, although it had not yet come to be reflected very clearly in the work done by the present respondents. It may be that WAP systems and mobile Internet interfaces may succeed in combining these technologies into a new level of operative environment that will achieve the much-vaunted breakthrough and lead to the eventual establishment of an information society.

8 Indices of communication capabilities

We will bring this empirical analysis to a close with an application of the indices of communication capabilities devised by Marja-Liisa Viherä in her doctoral thesis (1999) to the present panel data. The indices that she constructed comprise altogether several dozen variables and presuppose a division of the field into three aspects, access, competence and motivation, which she links in turn to three basic elements of human existence: to do, to be organised, to belong. The indices were developed separately for spoken communication and communication based on computers and an electronic network (Appendix 2) , and the idea lying behind them, as the name implies, is that the capabilities assessed by them are connected with a capacity for coping in the information society. The present empirical examination will consist of comparisons between these three indices of spoken or telephone communication and three indices of network communication.

According to Viherä, "People differ greatly in their communication capabilities. For some the telephone is by far the most important means of communication and is used to manage more or less any situation that may arise, from personal contacts to work matters, purchases and even banking, while others employ the whole range of devices available, their choice in each situation being based on possession by the opposite party of the equipment necessary to receive their messages. They make use of all the means available to them and are prepared to branch out into new technologies whenever these may prove necessary. This necessity arises largely from the communication possibilities of their friends and others with similar interests ... As far as participation in social interaction is concerned, the population can thus be divided into five groups: those who exercise influence, those who organize, those who go along with the others, those who refuse to be involved, and small entrepreneur.

Those who exercise influence are naturally aware of the importance of discussion and are inclined to organize their own thoughts by sharing them with others, while for those who are natural organizers it is most important to get things done. Those who go along with the others wish to take part in activities but are not prepared to accept responsibility for what is done or for how society develops, while those who refuse to be involved are not interested in community issues at all and small entrepreneur and people who jobbing are active in developing the community only in so far as their own work implies this." (Viherä 2000: 139, 141).

The indices of communication capabilities provide an interesting perspective on the changes that have taken place, because they combine the information contained in a number of variables within one parameter, and in this sense can be compared with the factorial dimensions identified in factor analysis. The indices are carefully constructed factors, as it were, which Viherä scales to a points range of 0-100 in order to render them mutually comparable. The factors contributing to each of the indices and the weights placed on them are listed in Appendix 2.

8.1 Influence of user experience on communication capabilities

First we will compare the indices of communication capabilities for the panel subjects in 1999 with those for the whole series in 1996 and those for the new sample in 1999, treating the sexes separately. Since no separate calculations of the indices for the panel subjects in 1996 are available, the comparison with the data for that year remains somewhat superficial, but as Table 8.1 shows, there were no great differences between the panel and non-panel subjects in 1999, although the former achieved slightly higher values.

We will look now at the differences in the indices of telephone communication between the re-

Table 8.1. *Indices of telecommunications capabilities by sex, in 1996 and in the panel and non-panel surveys of 1999*

Indices of telecommunications capabilities	Females			Males		
	1996	Non-panel 1999	Panel 1999	1996	Non-panel 1999	Panel 1999
Indices of telephone communications:						
Access index	49	70	71	59	75	80
Competence index	72	71	74	67	68	69
Motivation index	53	49	49	42	40	40
Indices of network communications:						
Access index	8	18	18	10	20	22
Competence index	23	37	40	28	40	46
Motivation index	43	50	51	39	43	44

spondents who had a mobile phone in 1996 and those who acquired one after that date. As seen in Table 8.2, possession of a mobile phone raises the access index to a new level but has little impact on the competence index and none at all on the motivation index. The level of competence was slightly better among the interviewees whose households possessed a mobile phone in 1996 than in the other groups, but it was still possible for both telephone communication competence and motivation to be high even without the possession of a mobile phone, so that one could not say directly, at least, that people lacking a mobile phone were alienating themselves from society.

Figure 8.1 serves well to reveal the close dependence of the index of network communication competence on use, in that the longer time for which a subject had been using a computer and the more frequently he was using it at the time of the 1999 interview, the higher the competence index. As Table 8.3 indicates, the motivation index was not dependent on the duration of use, or on its regularity or the standard of the equipment itself. Although one should not attempt to draw any far-reaching conclusions from the index, it would seem that the active individuals (those with a high motivation index) had begun to make relatively regular use of network access even though they managed with fairly simple equipment and only moderate competence.

Table 8.4 examines levels of network communication capabilities in terms of whether the respondent had been using a computer in 1996 or 1999. Both the competence index and the access index improved markedly with greater duration of computer use. It would even seem that the standard of the interface formed one aspect of motivation in the case of the female respondents. It may also be seen in Figure 8.2 that the index of competence was considerably higher among those aged under 30 years than in those over that age regardless of the time of commencement of computer use, whereas the index of motivation was systematically higher in the over 30 years age group.

Table 8.2. *Indices of telephone communications in 1999, by use of the mobile phone*

Use of mobile phone	Respondents	Index of telephone communications		
		Access	Competence	Motivation
No mobile phone in household in 1996 or 1999	(115)	41	70	47
No mobile phone in 1996, not used by respondent in 1999	(64)	40	69	45
Mobile phone in household in 1996 and 1999, not used by respondent	(47)	41	73	46
No mobile phone in 1996, in use in 1999	(376)	83	71	44
Household's mobile phone not used by respondent in 1996, used in 1999	(151)	83	71	46
Used household's mobile phone in 1996 and 1999	(448)	88	74	45

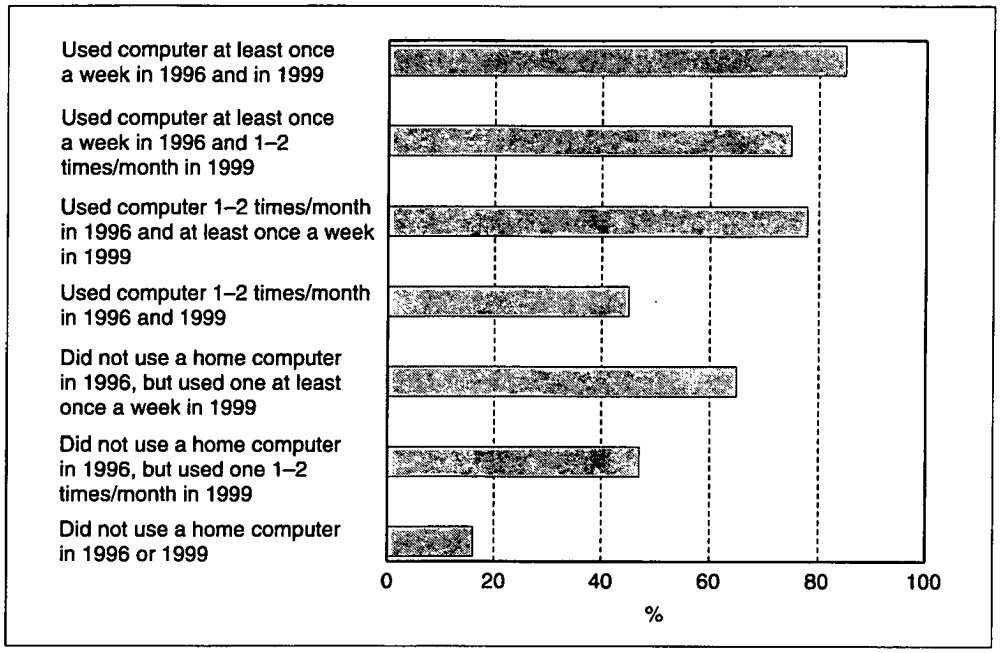


Figure 8.1. *Index of network communications capabilities in 1999 by use of a computer*

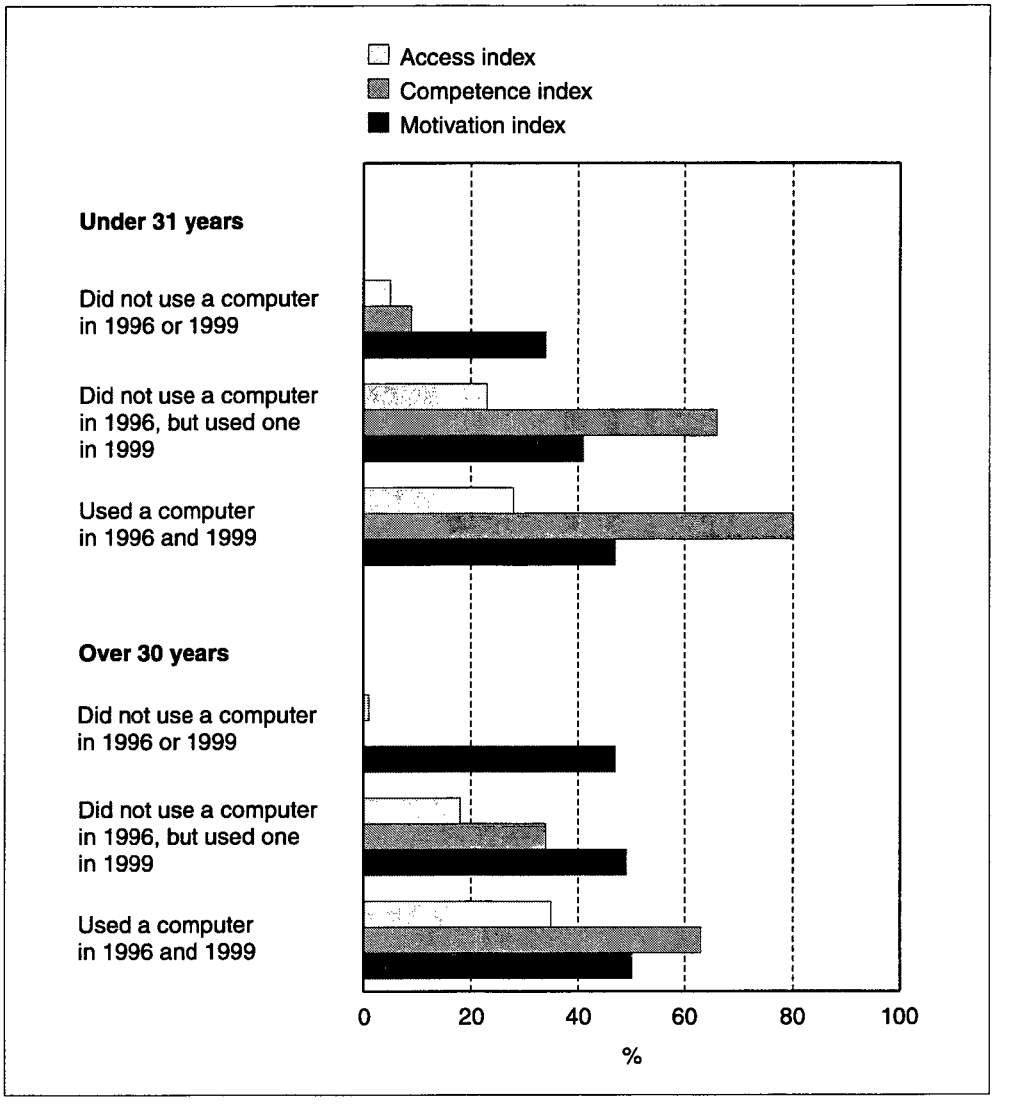
Table 8.3. *Access and motivation indices of network communications capabilities in 1999, by use of a computer*

Type of computer use	Respondents	Index of network communications	
		Access index	Motivation index
Not a computer user in 1996 or 1999	(585)	6	47
Not a home computer user in 1996. Used one 1–2 times/month in 1999	(89)	20	51
Not a home computer user in 1996. Used one at least once a week in 1999	(158)	33	46
Used a computer 1–2 times/month in 1996 and in 1999	(47)	23	53
Used a computer 1–2 times/month in 1996 and at least once a week in 1999	(43)	44	48
Used a computer at least once a week in 1996 and 1–2 times/month in 1999	(44)	37	51
Used a computer at least once a week in 1996 and in 1999	(202)	45	47

Table 8.4. *Indices of network communications capabilities in the panel survey of 1999, by sex and the use of a computer*

Used a computer somewhere	Respondents	Index of network communications		
		Access index	Competence index	Motivation index
Not used a computer in 1996 or 1999	(374)	2	1	46
Not used a computer in 1996, but used one in 1999	(150)	20	45	46
Used a computer in both 1996 and 1999	(655)	32	71	50
Males				
Not used a computer in 1996 or 1999	(174)	1	0	44
Not used a computer in 1996, but used one in 1999	(64)	23	46	42
Used a computer in both 1996 and 1999	(319)	35	75	44
Females				
Not used a computer in 1996 or 1999	(191)	2	0	47
Not used a computer in 1996, but used one in 1999	(83)	16	44	50
Used a computer in both 1996 and 1999	(259)	30	67	53

Figure 8.2. Indices of network communications capabilities in the panel survey data for 1999, by age (under and over 30 years) and use of a computer



8.2 Communication capabilities and attitudes towards the information society

The index of communication capabilities may also be influenced by attitudes towards the information society, an aspect that was studied here by comparing the indices with the results of the attitudinal items on the questionnaire. The indices of both telephone and network communication capabilities proved to be higher in those who disagreed with the statements listed in Table 8.5 and Figure 8.3, and the motivation index similarly gained higher values for these people than it did for those who agreed with the statements. Examination of the indices in relation to feelings of being left behind by the information society as expressed in the 1996 survey gave practically identical results to those obtained for 1999, except that the mean scores for access and especially competence in 1999 were higher for those who had reported in 1996 that they felt entirely left behind by developments in information technology than for those who report an equally strong feeling of this kind in 1999. We may conclude from this that some of the respondents who had perceived a danger of alienation in 1996 had taken positive steps to avoid that situation. Those who disagreed with the statement "New technologies will not help me to save either money or time" can be assumed to have better indices of communication capabilities than those who agreed with it, in which case the hypothesis to emerge is either that possession of the necessary access and competence can affect one's outlook on modern technology, or that possession of the appropriate outlook leads the indi-

Table 8.5. *Indices of telephone communications capabilities in 1999, by age, feelings of being left behind by technological developments and feelings of saving time and money*

	Indices of telephone communications capabilities		
	Access index	Competence index	Motivation index
Age and reaction to the statement "I feel entirely left behind by the advances made in modern technology"			
Under 30 years, agreeing with statement	68	63	41
Under 30 years, disagreeing with statement	78	71	46
Over 30 years, agreeing with statement	70	70	44
Over 30 years, disagreeing with statement	77	71	48
Age and reaction to the statement "New technologies will not help me to save either money or time"			
Under 30 years, agreeing with statement	78	72	45
Under 30 years, disagreeing with statement	78	75	46
Over 30 years, agreeing with statement	73	69	43
Over 30 years, disagreeing with statement	78	74	47

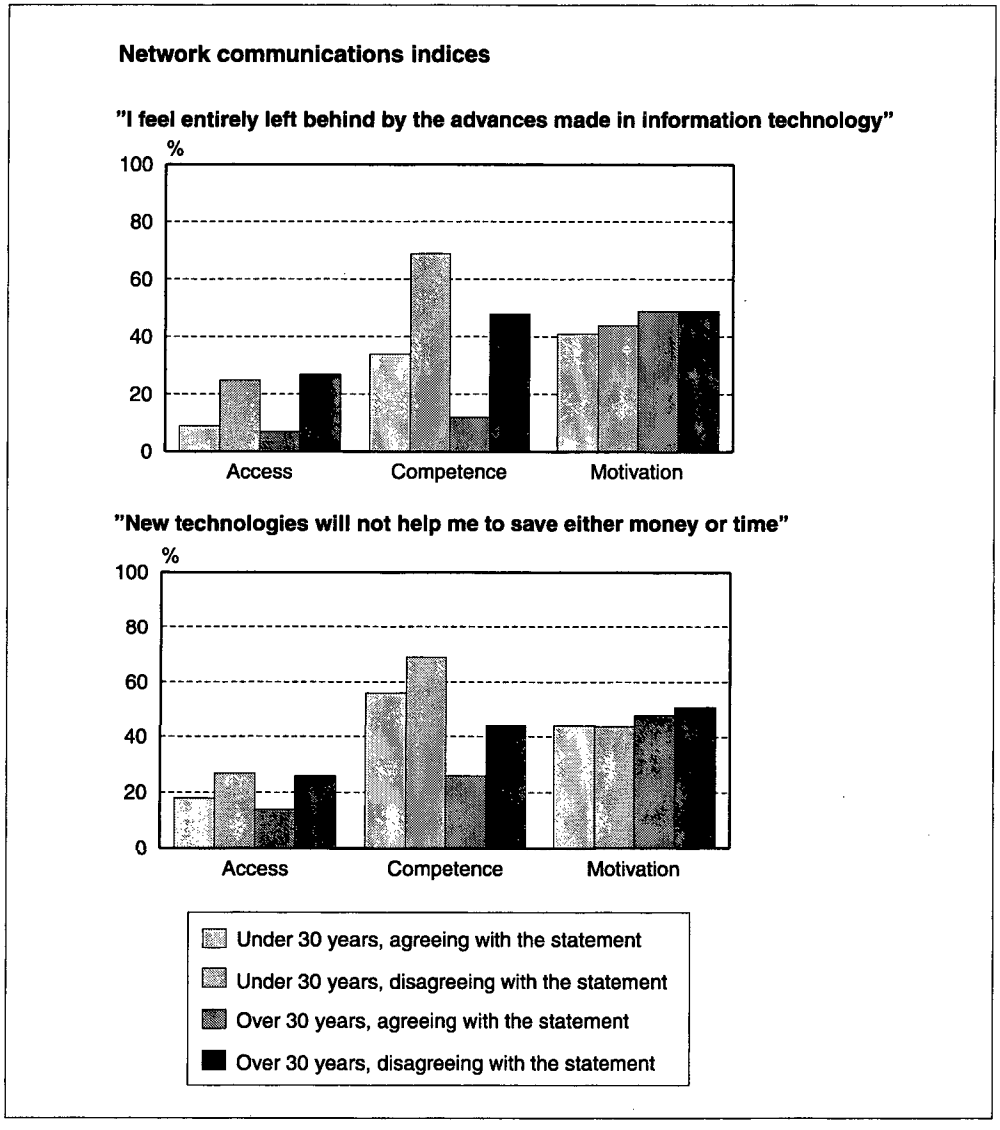


Figure 8.3. *Indices of network communications capabilities in 1999 in relation to feelings of being left behind by the advances made in modern technology and of saving time and money*

Table 8.6. *Indices of telephone communications capabilities in 1999, by age, worries about the flood of information and preferred means to organise things*

	Indices of telephone communications capabilities		
	Access index	Competence index	Motivation index
Age and reaction to the statement "The present flood of information doesn't worry me"			
Under 30 years, agreeing with statement	79	74	46
Under 30 years, disagreeing with statement	70	71	45
Over 30 years, agreeing with statement	75	71	44
Over 30 years, disagreeing with statement	75	61	49
Age and reaction to the statement "I prefer to organise things by telephone rather than by post or by computer"			
Under 30 years, agreeing with statement	78	74	45
Under 30 years, disagreeing with statement	79	73	47
Over 30 years, agreeing with statement	74	71	44
Over 30 years, disagreeing with statement	81	73	43

Figure 8.4. *Indices of network communications capabilities in 1999 in relation to worries about the flood of information and preferred means to organise things*

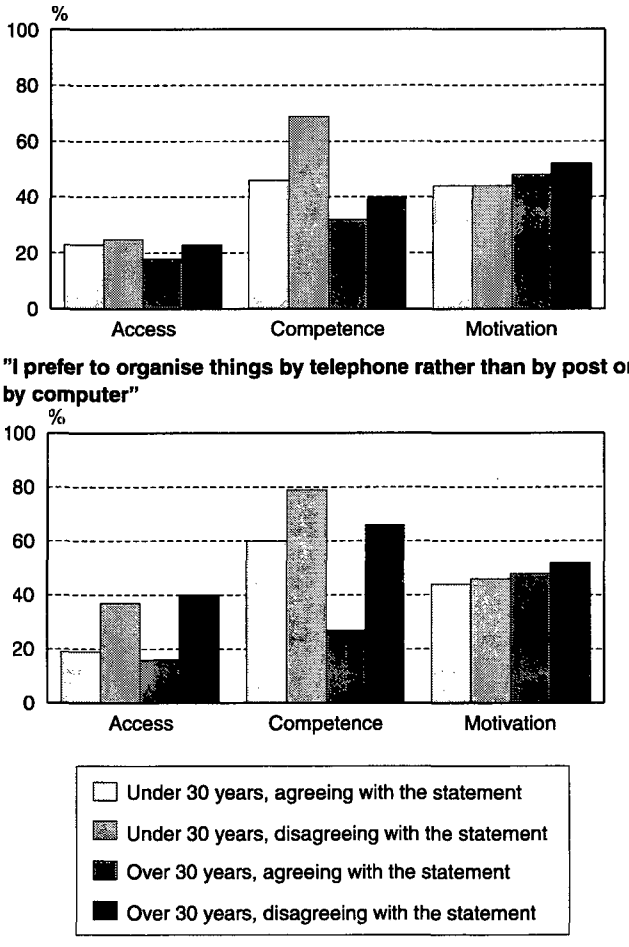


Table 8.7. *Indices of communications capabilities in 1999 by opinions on the effects of modern technology on the number of jobs*

Age and reaction to the "Modern information technology will create new jobs"	Part-indices		
	Access index	Competence index	Motivation index
Index of telephone communications capabilities			
Under 30 years, agreeing with statement	79	73	46
Under 30 years, disagreeing with statement	77	73	45
Over 30 years, agreeing with statement	77	71	45
Over 30 years, disagreeing with statement	73	54	45
Index of network communications capabilities			
Under 30 years, agreeing with statement	26	67	44
Under 30 years, disagreeing with statement	19	59	44
Over 30 years, agreeing with statement	22	37	49
Over 30 years, disagreeing with statement	16	29	49

vidual to acquire the equipment and learn to use it. The expected difference is certainly to be seen in the indices, in that those who reckoned that they saved time and money by using modern technology had higher access and competence indices of network communication capabilities. The difference in the case of telephone communication competence was only a minor one, but still operated in the same direction.

The statements *"The present flood of information doesn't worry me" and "I prefer to organise things by telephone rather than by post or by computer"* can also be assumed to be connected with the indices of communication capabilities. Table 8.6 shows that those who were not disturbed by the flood of information had better access and competence indices of telephone communication than those who were worried on this score (although the latter group was admittedly small), while the situation with regard to network communication was the reverse (Fig. 8.4). This might lead us to conclude that network access and competence merely open the floodgates to a superfluity of information. The values for the motivation index nevertheless suggest that experiences of this kind do not lead to passivization.

In the case of the statement *"I prefer to organise things by telephone rather than by post or by computer"*, Table 8.6 indicates firstly that those who agreed with it had even lower indices of telephone communication capabilities than those who disagreed with it, from which we may tentatively conclude that the mobile phone is not as crucial an instrument for managing one's affairs as we might be led to think but serves most of all as an instrument of social interaction. Very wide differences in the index of network communication capabilities (Fig. 8.4) existed between those who agreed and disagreed with this statement, even extending to the motivation index. This is fairly definite proof that the capabilities to look after one's affairs via the Internet, for instance, improves with the acquisition of suitable equipment, increased competence and greater experience in the use of the systems concerned.

Table 8.7 examines the indices of communication capabilities in relation to reactions to the statement that *"Modern information technology will create new jobs"*. Here the respondents who agreed with the statement had markedly higher indices of both telephone and network communication capabilities. Here again, a good interface and good access go with a greater confidence in the beneficial effects of modern technology on employment. Cross-tabulation of these indices of communications capabilities and opinions on the information society indicated that personal experience of new information and communications technology was directly connected with attitudes towards the information society. This supports, at least indirectly, the claim put forward by Pantzar that new technologies tend to shape their own operating environments.

8.3 Migration and the indices of communication capabilities

Viherä, who has herself examined regional variations in the indices of communication capabilities, maintains that "The culture of the information society is often referred to as an urban culture. Abandonment of the countryside is regarded as more or less inevitable, at the same time as information technology and communications are looked on by some as the salvation of the rural areas."

In her analysis of the communication indices in relation to the type of area to which migration occurs (Table 8.8), Viherä (2000: 157, 158) notes that "The indices of telephone communication do not differ greatly by place of residence, although the access and competence indices are slightly higher in the towns, both the town centres and the suburbs, than they are in the countryside. Similarly, trends in the access and competence indices of telephonic communication over the last three years have been more or less in the same direction

Table 8.8. *Indices of communications capabilities by place of residence*

	Index of telephone communications capabilities								
	Access			Competence			Motivation		
Place of residence	1996	1999	Change %	1996	1999	Change %	1996	1999	Change %
Town centre	51	73	43	73	71	– 3	52	46	– 11
Suburb	55	74	34	70	71	1	48	44	– 8
Rural population centre	55	70	27	68	67	– 1	47	47	0
Village, countryside	54	70	30	67	67	0	46	43	7
	Index of network communications capabilities								
	Access			Competence			Motivation		
Place of residence	1996	1999	Change %	1996	1999	Change %	1996	1999	Change %
Town centre	10	21	110	29	43	48	46	47	2
Suburb	12	21	75	31	43	39	41	45	10
Rural population centre	8	16	100	23	35	52	41	50	22
Village, countryside	5	15	200	15	30	100	41	46	12

Table 8.9. *Indices of communications capabilities in 1999 by migration between regions of Finland and between municipalities*

Index of communications capabilities and type of migration	Respondents	Part-indices		
		Access index	Competence index	Motivation index
Index of telephone communications capabilities				
Migrated between regions	(136)	74	72	48
Not migrated between regions	(1 110)	76	72	45
Migrated between municipalities	(242)	74	72	48
Not migrated between municipalities	(1 004)	77	72	45
Index of network communications capabilities				
Migrated between regions	(136)	23	51	47
Not migrated between regions	(1 110)	20	42	50
Migrated between municipalities	(242)	23	51	47
Not migrated between municipalities	(1 004)	19	41	47

regardless of place, the access index having risen by 30%. It would seem that the motivation for social participation has diminished slightly in the towns, however, and the network communication indices for the countryside, and even the rural population centres, are gradually catching up with those recorded for the towns, although the difference at present is still of the order of some 40%. Communication competence have improved far more in the sparsely populated country districts than elsewhere, undoubtedly partly in response to EU and other programmes. It is only to be hoped that this growth has not been too slow in getting started."

We will now take a look at the indices of communication capabilities for the panel respondents in terms of migration patterns with the aid of a few tables, the aim being to determine whether migration is selectively concentrated in individuals with particularly good communication capabilities. We will take the exceptional step here of using as our areal units the old administrative provinces of Finland, as these form a more rational division of the country from a functional viewpoint than do the new provinces and serve better for the description of long-distance migration than do the present-day planning regions.

As may be seen from Table 8.9, although the indices of telephone communication capabilities were no higher among either those who migrated between any two of the twelve provinces or those who migrated between municipalities than among those who did not migrate at all, the competence index of network communication capabilities was markedly higher for the migrants than for the non-migrants and the access index slightly higher. Migrations between urban and rural areas are examined in Table 8.10 (the figures in which include those of Table 8.9 wherever the moves had resulted in an urban/rural change). These migrations again do not appear to imply any powerful selectivity related to the index of telephone communication capabilities, although those who did not move and those who moved to a rural area were presumably older on average than the other groups, as reflected in the competence and motivation indices. As far as the index of network communication capabilities is concerned, however, those who moved to rural areas had lower scores than the others, and the access index also remained low for those moving to urban areas (frequently young people), although their level of competence was high.

The differences in indices of communication capabilities between those migrating between different areas and those not migrating at all would seem to be attributable mainly to the fact that young people move more often than older people, and it may be concluded from the results that any areal differences in communication capabilities are unlikely to increase appreciably as a result of the

Table 8.10. *Indices of communications capabilities in 1999 by migration between types of built-up area*

Index of communications capabilities and type of migration	Respondents	Part-indices		
		Access index	Competence index	Motivation index
Index of telephone communications capabilities				
Not migrated between types of built-up area	(929)	77	71	45
Migrated from a rural to an urban area	(78)	71	75	47
Migrated from an urban to a rural area	(79)	77	71	43
Migrated with an urban or rural area*	(160)	74	73	48
Index of network communications capabilities				
Not migrated between types of built-up area	(929)	21	43	48
Migrated from a rural to an urban area	(78)	17	43	48
Migrated from an urban to a rural area	(79)	15	38	44
Migrated with an urban or rural area*	(160)	21	48	51

* Includes migration between a town centre and a suburb or between a rural population centre and the countryside.

selective effects of migration. The predominance of young people among those moving into the urban centres does mean some flux of communication capabilities in that direction, while the migration of elderly people within the rural areas implies a flux that does not entail such a great reserve of communication competence.

The above examination of indices of communication capabilities demonstrated that competence and access are closely associated, especially where network communication is concerned. In addition, it emerged that levels of the access and competence indices vary along with attitudes towards the information society. It is difficult to say which exercises the more powerful influence, favourable attitudes or favourable experiences with access and competence. A rough evaluation of the impact of migration of population does not suggest any major drift of communication competence from the more remote areas towards the towns other than that caused by the usual migration of young people into the centres.

9 Summary

This final chapter gathers together the main findings and attempts to comment on them briefly wherever this is appropriate. The reader, too, is invited to deliberate over them in the spirit of the quotations from Pantzar presented in the Introduction and assess as a matter of personal opinion the magnitude of the evidence for the claim that modern information and communications technology is shaping the functional structure of society and its citizens in a direction which favours its own further adoption.

9.1 Changes in opinions

One important finding was that the population under 30 years of age has become more favourably disposed towards modern technology. The change in outlook within the space of three years was a substantial one, and it may be that social pressure from the environment and the strength of peer examples have had a major impact on the behaviour of the young people in particular. There was also quite a considerable difference between those under and over 30 years of age in their reactions to the statements *"I am more interested in social and cultural affairs than in technology and technical equipment"*, *"I am a do-it-yourself person"* and *"Cheap, simple equipment is good enough for me"*, acceptance of which had diminished very markedly among the young people, representing a clear preference for more expensive, high-quality equipment at the same time as opinions among the older age group were moving towards satisfaction with basic equipment.

The respondents views of the future had become more optimistic in the course of the three years, although data security worries had increased noticeably among those aged under 30 years in particular, and also to some extent in the 30–49-year age group. On the other hand, there had also been some drift in the opposite direction, since as many as a fifth of the young people reported being less worried about security than they had been three years earlier, and about a third of the older age group were of the opinion that security had improved. It remains the case, at least for the present, that the vast majority of Finns do not feel that there is a threat to the security of data or to their personal privacy on account of the use of modern information technology.

The feeling of being left behind by developments in information technology had certainly not increased among the subjects in the panel survey, but notions of the usefulness of the devices currently on the market had diminished over a broad front, to the extent that every second respondent expressed doubts about the rational benefits to be gained from the new generation of equipment in terms of savings in either time or money. A major change in attitude was recorded regarding the statement *"Modern information technology will create jobs"*, the number of respondents who agreed with it entirely or to some extent having more than doubled (21% → 48%), although the result still means that a half of the Finnish population is sceptical of the beneficial effects of modern technology on employment. The general social situation is reflected exceptionally well in the reactions to this statement, for prior to 1996 the banks, for example, had laid off very large numbers of employees on the grounds of the introduction of new computer technology, whereas by 1999 there had been talk in public of a shortage of labour in the high-tech industries. The views of the respondents had evidently been shaped to great extent by these contrasting situations. As far as the statement *"The present national television channels are sufficient for me"* was concerned, the panel subjects were more unanimous than ever that the present channels were sufficient (71% → 85%), as many as 75% reiterating the opinion that they had expressed on the previous occasion. These views do not promise a very rapturous reception for the new digital television channels that are at present being planned.

Reactions to the statement *"The present flood of information doesn't worry me"* had remained virtually unchanged (90% → 88% in agreement), although examination of the results at the individual level revealed a small increase in perception of a flood of information, in that 23% had become more aware of this situation as against only 18% who had become less aware of it. It is nevertheless the case that the flood of information is a problem for only a very small minority of the Finnish population and that it is largely a feeling that emerges in response to a particular situation rather than a permanent state of mind. The alteration in the number of respondents agreeing with the statement *"I prefer to organise things by telephone rather than by post or by computer"* was not a large one (89% → 85%), but nevertheless perhaps one that supports the notion of a progression towards the information society, on account of the reference to the use of computer networks.

9.2 The mobile phone as a tool for everyday life

The mobile phone has become a permanent instrument of communication for the Finnish people, and has certainly not remained simply an object of brief experimentation. It is obviously a device that is capable of rapidly shaping the behavioural patterns of its users, and its convenience is such that it is able in the course of time to induce them either to accept the higher prices of calls or to ignore them. The present results suggest that there are no great pressures for any reduction in the tariffs for mobile calls, and it would indeed be interesting to study in more detail how much a substantial reduction in the cost of mobile phone calls would affect the use made of conventional wired phones. At least the above data together with earlier findings (Nurmela et al. 2000: 17–18) would suggest that the number of calls made by wired phone would be reduced markedly on every occasion where the caller was free to choose between the two.

The female respondents made a noticeably smaller proportion of their calls by mobile phone, and the number claiming to make shorter calls by mobile phone than by wired phone was considerably higher than in the case of the men. The population under 30 years of age made abundant use of mobile phones and spoke for longer than their older counterparts, while those aged over 50 years were more aware of the costs involved than was the 30–49-year age group. The young people appear to have evolved a quite distinct manner of using the mobile phone relative to those over the age of 30.

It would seem that a higher proportion of those who were already using a mobile phone in 1996 had adopted it on rational grounds of increased efficiency than was the case among those who acquired one later, whose motives were in turn more closely connected with questions of social interaction. Long-term use of a mobile phone appears to establish it as a progressively more integral part of the user's everyday life, although another interpretation of the differences observed between those who had used a mobile phone for a longer or shorter period of time could be that those who adopted it at an early stage were moved to do so by a much greater practical need arising from their own situation in life. Those who have taken to it more recently have presumably had other motives, but the rapid increase in the number of users may well imply a general rise in the practical need for mobile phones, as the pulse and group dynamics of social life may themselves have changed with the transition to real-time contacts between individuals and the flexibility of group decisions regarding future activities may have increased with the greater accessibility of group members.

The fact that the young people and women were more interested in the new additional services available by mobile phone than the men and those over 30 years of age may be connected with women's greater attraction to services that can facilitate the "logistics" of everyday life. It was also the case that the respondents who had been using a mobile phone for longer were more interested in such services than those who had recently acquired one. The use of a phone for making purchases was of interest only to a small proportion of the young respondents.

Three facts emerged regarding the use made of mobile phones. *Firstly*, the longer it has been in use, the more it seems to have established itself as an essential part of its user's activities. Very many appliances have come onto the market over the years which have not succeeded in finding a functional niche of their own in people's everyday lives once their initial novelty has worn off, but no decline in enthusiasm has been seen in the case of the mobile phone, which has merely increased its range of uses as time has gone by. *Secondly*, the motives for acquiring a mobile phone seem to have followed the utilitarian pattern characteristic of the early stages of innovation theory, in that the justifications put forward by those who had already been using a mobile phone in 1996 more often made mention of practical benefits and efficiency than was the case with those who had begun using one later. *Thirdly*, it seems that the range of functions and services that were actually used was dependent to a considerable extent on the range available at the time of acquiring the phone and the social reference group to which the user belonged. Once they have become fixed in a certain routine, users do not easily explore new functions or services. This is evidently a barrier that poses a serious challenge for those responsible for marketing new functions and services in a situation such as that prevailing in Finland, where there are few potential new users any longer and many people have had time to establish a fixed routine with regard to their mobile phone behaviour.

9.3 Little enthusiasm for computer and network skills

The basic computing skills of the respondents who had recently acquired a computer were surprisingly inferior to those of the people who had been using one for more than three years. In the case of the loading of programs and the copying of these from the Internet, one is tempted to think of the long-standing users as "pioneers" who had set up their own computers from the outset, whereas those who came into computing later were used to having everything "served up" for them, i.e. they had bought a computer on which the necessary programs had already been installed, so that they had no need to learn these basic skills.

Examination of the command of software functions achieved by those who were interviewed in both years indicated a considerable improvement in skills at the individual level. Over 60% reported that both their use of an Internet browser and their ability to copy a file onto a diskette were better in 1999 than they had been in 1996, and almost as many (56%) felt better able to use Email. Similarly, almost a third had a better command of word processing, spreadsheet programs and database management than in 1996. The least improvement, affecting only one respondent in every four, was achieved in the use of graphics and desktop publishing programs. More of the women had improved their software skills than of the men.

The reasons for the new users of computers evaluating their software skills at a substantially lower level than those who had been using one for over three years may be sought in the needs and motives lying behind computer use. The data on numbers of people using a computer and the situations in which they use it suggest that the difference may lie, at least to a significant extent, in the amount of experience in computer use that the individual had gained. A short-term user will not have had the need or the opportunity to use either a computer or a data network to by any means the same degree as a long-standing user. In this sense one cannot speak at all vociferously of marginalisation from the information society in the sense of a conscious withdrawal from the sphere of computing.

The most natural conclusion to be drawn from the data on the use of a home computer by those who have been computer users for some time is that the frequency of use has not increased greatly after the initial experimental stage. Alongside word processing, only the Internet has become an established habit in home computer use, whereas the "entertainment and commodities" offered by other programs have not gained any permanent foothold even within the routines of those who have been using a computer for more than three years. Thus it may be said that the computer and its data networks have not assumed a natural role

in people's everyday lives on by any means the same scale as the mobile phone.

9.4 Workplaces entering the information society slowly but surely

Since it is often claimed that people's work is changing at a hectic pace and that they are constantly having to learn new skills etc., we set out to examine the use of the telephone, computer, Email and Internet at work on the basis of the panel data. The importance of the telephone at work had not altered at all in the three-year interval, and those who had begun work within that period used the telephone to much the same extent as those who had been at work for longer, or perhaps just slightly less. Thus the networking that is regularly spoken of in connection with industry and commerce is not reflected to any marked degree in the use made of the telephone, although it may be apparent in the case of Email.

Similarly, no appreciable changes in the use of computers at work had taken place over the three years, except that the proportion of people who had a computer of their own at work had increased (29% → 35%) and the proportion not using a computer at all had diminished (45% → 40%). The number of people sharing a computer with others had remained unchanged. Of those who had begun work in the interim, a half were in jobs where computers were not used at all and only something over a fifth had a computer of their own at work. The results imply that the trend towards computerization at work that was visible at the end of the previous decade had accelerated slightly. Only those respondents who had a computer of their own at work almost always had an Email address as well, while those who shared a computer had access to Email far less often. All in all, only 46% of the employed respondents had Email facilities in 1999.

The most significant observation regarding changes in Internet use on the part of those who had already been using it in 1996 and regarding its use by those who had become acquainted with it since that time through their work or studies was that Email had come to replace the telephone for external communications in particular far more often by 1999 than it had by 1996. A second distinct change was that the Internet was being used more and more as a source of information, other uses being fairly rare in a working situation. The sender of an Email nowadays can be more certain than ever that the message will be read the same day, so that in this sense the system is better placed to serve as a substitute for the telephone. The majority of those who used a network at work sent less than 10 Email messages a week, but the numbers received tended to be slightly greater. Some 5–7% of the respondents sent and received over 100 Emails a week, a group that may be imagine to suffer from a certain flood of information, although it must be remembered that their use of the telephone may have diminished by a comparable amount.

This examination of the progression of Finnish working life towards the information society leads us to conclude that modern information and communications technology is certainly expanding in this field but that the changes are not yet taking place at any great speed. It was not possible in this connection to determine whether computers and network connections were in use in the majority of instances in which they could be deemed justified or whether there were still a large number of workplaces where greater efficiency could be achieved by their introduction. On the other hand, it must be realized that modern information technology itself is developing all the time and expanding its areas of application. The use of Email and the obtaining of information from the Internet had increased and become matters of routine, and at least in this sense it may be said that the movement towards an information society had continued and gained in depth in the case of those forms of work to which new technology is applicable.

The changes in the use made of modern information and communications technology detected here may be summed up briefly in the following way:

a) Use of the telephone for work purposes has not increased.
b) Email has become a major means of maintaining contacts.

c) The use of computer programs does not seem to have infiltrated into people's lives at the same speed, at least, as has the use of a mobile phone.
d) The skills and competence of new users of a computer and data network were considerably poorer than those of the people who had been using one in 1996. One reason proved to be the lower frequency with which they used these and the narrower range of needs that they had in this respect, so that their skills simply did not develop. It may be conjectured that in the case of those who were using a computer in 1996 the reasons for them acquiring one had been connected with the achieving of greater efficiency. The computer is, after all, a relatively expensive investment, and the justification for a company acquiring one must in the majority of cases involve at least some mention of advantages in terms of efficiency.

9.5 Trends in the indices of communication capabilities

The indices constructed by Viherä comprise altogether several dozen variables and are based on a three-way division into access, competence and motivation indices, which she links to the basic dimensions of human existence: to do, to be organised, to belong. Separate indices are developed for spoken communication and communication based on computers and electronic networks (Appendix 2). Lying behind the indices is the assumption, already implied in the name, that the abilities assessed by them are relevant to coping in the information society.

The competence and motivation indices of spoken communication ability can be high even without the possession of a mobile phone, so that it could not be claimed directly, at least, that non-possession of a mobile phone was a criterion for alienation in terms of these indices. The motivation index of network communication ability would not seem to be directly correlated with the duration or regularity of using a computer, nor with the standard of the computer equipment. Although one should not attempt to draw any very far-reaching conclusions from the indices, it would seem that a group of active individuals exists (high motivation index) who have begun to use the Internet relatively regularly but manage with fairly simple access and only moderate skills.

The indices of communication capabilities may also be affected by general attitudes towards the information society, an aspect that was examined here by means of the questionnaire items dealing with such attitudes. Those who reckoned that modern technology could help them to save time and money had higher access and competence indices of network communication, but the difference was small in the case of the indices of telephone communication capabilities, although still operating in the same direction. Likewise, those who did not suffer from a flood of information had higher scores on the access and competence indices of telephone communication capabilities than those who did suffer in this way, whereas the situation was reversed in the case of the indices of network communication capabilities, those who suffered from the flood of information having better access and a higher level of competence than those who did not suffer. The feeling of anxiety at the flood of information does not lead to passivization, however, at least not in the light of the motivation index used here. There were major differences in the indices of network communication capabilities between those who preferred to organise things by telephone and those who preferred some other means, even in the case of the motivation index, in that the readiness to organise things by Internet increased with improved access, competence and experience as a user. A good access and good competence also increased the individual's confidence in the beneficial effects of new technology on employment, and cross-tabulation of the indices of network communication capabilities against attitudes towards the information society demonstrated that personal experiences of modern information and communications technology were connected with views on the information society. This provides at least indirect support for the claim made by Pantzar that new technologies shape their own operating environments.

Taken all in all, the present analysis of the panel data covering three years of the information society indicates that progress is being made towards that state but that the changes with regard to data networks have not been so profound as those with regard to the telephone. The mobile phone has achieved a strong, comprehensive position in the lives and activities of the Finns and has proved capable of responding to the challenges of both rationalization and socialization much better, more quickly and at cheaper purchasing prices than have technologies based on the computer and network connections.

This analysis of panel data proved methodologically to be an interesting approach and one that enabled a considerably more precise picture of the change factors to be constructed than can be obtained from cross-sectional data, since it provides information on movements of individuals in both directions, e.g. both the adoption and the abandonment of an innovation. Panel data would also be extremely expedient for monitoring the stage in development of innovations, and its interpretative strengths became apparent in the present context most especially in connection with the development of users' competence as a function of the duration of usage. It would be possible in many surveys to make more use of retrospective questions as a substitute for panel data, but the construction of successful questions for this purpose would require a great deal of developmental and experimental work in order to be sure of gaining interpretable results.

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Appendix 1

Who took part in the panel interview

This appendix contains detailed information on the representativeness of the panel data, which may be of value to researchers wishing to compare different sets of results in terms of reliability. This will not be a reiteration of the description of the material and its compilation provided in Chapter 2, nor will it be concerned with sampling and the calculation of weightings, which are described in the basic reports (Nurmela 1997/12, Nurmela et al. 2000/5).

Comparison of those agreeing to and refusing inclusion in the panel survey in 1996

Altogther 1544 respondents aged 12 years or over, 68.5% of the total, agreed to a second interview at some time in the future, a fairly high proportion bearing in mind that consent for this was asked for as the last item on the questionnaire form and the matter was not mentioned by the interviewer at all. The tables drawn up for comparison between those who agreed to a second interview and those who did not were calculated using weightings standardized by reference to the representativeness of the whole material, i.e. the weights were multiplied by the ratio of the number of observations (2254) to the total population at risk (3 922 236).

Representativeness was assessed with the χ^2 test, by comparing the distributions of answers between the subjects consenting to a second interview and those refusing, first in terms of the background data and then in terms of the actual variables to be studied in 1996. The idea here is to go through the similarities and differences between the groups briefly variable by variable, paying attention to the relevance of these to the possibility of selectivity in the population interviewed on the second occasion. It may be assumed, for instance, that a person would be more likely to agree to a second interview if he or she was "involved in the information society" and would be more likely to refuse if "alienated" from it. Any selectivity of this kind should naturally be taken into consideration when interpreting the distributions of answers obtained in the second interview. The results of the comparisons between those who consented to such an interview and those who refused will be presented concisely below.

Background data

The young respondents (15–29 years) had been more eager than average to give a second interview, and those over 50 years the least. Although there was no statistically significant difference between the sexes, the men had committed themselves to a further interview slightly more often than the women. Less people than average had agreed among the pensioners, but more than average among the unemployed and students. Entrepreneurs had been very much less willing to consider another interview. The differences in basic education were in fact all explicable in terms of age, but a smaller proportion of the respondents with a university degree agreed to another interview than of those with a vocational qualification. Those who were still at school, university or college were more willing to give another interview than the others.

Use of information society technology

A statistically significantly higher proportion of those who refused a second interview did not have a mobile phone in their household, although there was no difference between the groups in the proportion of people who used the mobile phone that their household possessed, nor in the use of the

telephone in general. It would seem that the main users of a mobile phone were slightly less inclined to give a second interview than the others.

The two groups did not differ significantly in the number of telephone calls made, nor in their use of a home computer, nor was there any difference in habits connected with using the telephone that could rationally be linked with agreement to a second interview. Similarly, no differences were found with regard to the services obtainable by means of their home telephones, although slightly more of those who agreed to an interview had an audio frequency or digital phone. The groups did not differ in their need to use the telephone at work, nor in the number of telephone calls received at work.

Those who consented to a second interview used a home computer slightly more often than those who refused, but there was no difference in the time of first using one or in the use of this computer for Email, Internet or word processing purposes. Similarly, no differences were observable relative to the potential for distance working, the use of a PC at work or the mastery of basic PC skills, nor in the case of belonging to an employer's Email system, possession of facilities for sending external Email messages from work or access to the Internet from work. As far as television was concerned, the differences lay mainly in the fact that those who agreed to a second interview (being younger on average) were more superficial in their viewing habits and made more use of text TV.

Differences in opinions and attitudes

The two groups showed statistically significant differences in their attit6udes towards the future, those who agreed to a second interview being more positive in this respect (reasonable opportunities for influencing affairs, changes taking place at the right speed and in the right direction, the future full of possibilities) than those who refused (poor opportunities for influencing affairs, changes too fast and in the wrong direction, unhappy about the future). Cross-tabulation showed the reactions to be highly dependent on age and to be largely explicable in these terms, since consent to a second interview was most common among those aged under 30 years and very much less common among those over 50 years.

The groups also showed statistically significant differences with respect to data security and opinions on the information society, but this was chiefly dependent on differences in the strength of their opinions for and against or on the fact that those who refused a further interview were more inclined to reserve judgement on the first occasion, too.

Summary of the differences between those agreeing to a second interview and the others in 1996

All in all, it may be said that the differences between those who agreed to a second interview in the future and those who refused were very minor ones, with the exception of the fact that a higher proportion than average of the young respondents agreed and a higher proportion of those over 50 years of age refused. It was also apparent that those who agreed to the interview were more optimistic about the future than those who refused, a situation that may have something more behind it than simply a growth in realism with age. Thus it is important to bear in mind when considering the flows revealed by the panel survey that the respondents included a larger than average proportion of young, more active persons with a positive attitude towards the future.

Comparison of the panel and non-panel subjects in 1999

In considering the situation as far as the total set of respondents in 1999 is concerned, we are obliged to assess whether the answers given by those panel members who had agreed to a second interview differed in any systematic way from those of the new sample drawn in that year. This approach assures the generalizabilty of the assessment of changes in the other direction, as it were, by reference to the 1999 situation.

Opportunities for assessment

There are many ways of comparing the panel members with those of the new sample who

agreed to the interviews. There could scarcely have been any differences in availability, except that in principle the commitment made three years earlier obliged the panel members to take part in the new interviews in principle, so that non-response should have been lower than in the non-panel sample. Since those who had not been active in acquiring and using new information and communications technology may have been unwilling to take part in the repeat interviews, one clear and simple means of investigating whether refusal to take part in another interview was connected with a sense of alienation would be to examine the reasons for refusal given by those who had originally agreed to an interview and the members of the non-panel group.

The question about a second interview had been put to the respondents at the end of the written questionnaire on teledemocracy and attitudes to the future, and permission had been obtained from 1547 interviewees (aged 15–74 years) to retain their contact details for the purposes of a second panel interview later. After an updating run in August 1999 and various updates in the course of the survey, at least some contact information was found for 1529 of these persons, of whom 1246, or 81.5%, gave a new interview. This means that the loss on this second occasion was very low. Also, these people represented 942 households, of which 83.4% were covered in the second interview. There were only 48 people who did not take part in the new interview even though someone else from their household did. In the case of the non-panel sample, 64% of the subjects requested took part in the interview, representing 69% of the households concerned, so that at least in this respect the participants in a second interview can be said to have been actively involved in spite of the fact that three years had elapsed.

Comparison of reasons for non-response between the panel and non-panel in 1999

The tabulations indicate that there were no significant differences in the reasons for non-response between these groups. Comparison of the percentage distributions of these reasons shows the panel subjects to have been busier on average than the non-panel ones, which would seem logical in the light of the observation made above that these people were younger on average than those who refused to take part in a second interview. Many of these busy young people had probably established households of their own in the meantime and begun to work for their living, which would have meant a still busier life than ever. The proportion refusing an interview on principle or on account of the topic was about the same in both groups. The only possible indication that some alienated persons had dropped out of the group invited for a second interview was that this group contained more cases for which no reason for refusal could be discovered than did the non-panel sample. More women dropped out of the panel survey on principle or on account of the topic than from the non-panel survey, while more of the men explained their refusal in terms of shortage of time than in the non-panel group.

Examination of the reasons for refusal in relation to age further confirmed the impression that shortage of time and an altered situation in life were more typical reasons among the panel subjects than among the non-panel ones. The elderly panel subjects (over 55 years) may have included more who had refused because of alienation from the information society, as there were distinctly higher proportions of cases in which no reason was forthcoming and in which the reason lay in the topic itself. Many of the people in this group had reached retiring age during the three years and may have felt that this was no longer a matter that had anything to do with them. Something over one percent of the people who had agreed to a second interview were over 75 years of age by 1999.

In summary, it may be stated the loss of less than 20% in the population of those who had promised to give a second interview would not seem to entail features jeopardizing the representativeness of this group to any essential degree relative to what it had been at the time of promising this interview three years earlier, given the slight weighting in favour of young people and more positive attitudes towards the future that had prevailed at the time. It is not probable, therefore, that those who had dropped out at that stage had done so systematically because of a sense of alienation.

Appendix 2

Measurement of communication capabilities

This appendix contains a description of the indices of communication by telephone and computer networks developed by Marja-Liisa Viherä, and is based on chapter 7 of her book "Digitaalisen arjen viestintä" (Communication in everyday digital life; Viherä 2000:149–156).

Background to the indices

The variables to be used for describing citizens' communication capabilities were selected from those used in the analysis of the interview material for the project "The Finns and the Future Information Society", and in a sense come into the category referred to by Törnqvist (1974) in his remark that "when there is a need to find a measure for a complex concept it is usually better to construct at least some sort of substitute for it than to abandon the attempt entirely." He goes on to add that it is always possible to improve such indicators later on the grounds of the criticism received.

The indices to be described below represent the best possible empirically calculable measures and are by no means derived directly from the theory. Since one cannot obtain a direct solution to the problem of communication abilities from sets of interview material, because they are composed of numerous contributing factors, it is necessary to resort to selective compression of statistical data in order to describe the essential concepts. The selected variables may then be combined into indices of communication ability, the ultimate purpose of which is to describe the variation in this ability according to certain background variables. The operationalization of this concept on an empirical level does not always correspond entirely to the reality which one wishes to assess with the measure under construction, and if the systematic deviation is too great, the measure will not be valid. If, on the other hand, the results include too large a random error, as manifested by excessive variance between replicates of the same applications, the measure will not be reliable. These two aspects, reliability and validity, together constitute the quality of the measure. The most problematic issue in this sense is the formation of an indicator of the motive lying behind communication abilities, but it is still necessary to attempt to describe motivations in our society on the basis of the material available to us.

As Törnqvist notes, "it is essential when setting out to form social indicators to be well aware of the purposes of this, i.e. what (theoretical concept) they are intended to measure." The purpose of the motive index in connection with communication capabilities is to describe the motive for acting in the information society that arises from the very existence of a body of citizens. It is the realization of this motive that then calls for the adoption of given means of communication.

Validity is usually defined as the ability of a measure to assess precisely what it is intended to assess (Alkula, Pönttinen & Ylöstalo, 1995: 89), and is thus directly associated with the difficulties attached to operationalization. Investigations of the survey type in particular involve a large set of questions by which an abstract concept can be described, and this is the case in the present research, too. It is necessary to select from the set of questions used in the interviews those that are most relevant to people's communication abilities, and this selection can be nothing more than a well-argued statement of opinion on the part of the researcher.

Validity is not merely a problem of operationalization, however, but rather an aim to be borne in mind throughout the whole planning stage and during measurement as well (Alkula et al. 1995). Possible sources of error include falsification of answers in the interview, misunderstand-

ing of the questions, etc., and an experienced interviewer should be able to minimize these. Thus validity can be divided into the contributory concepts of prediction validity, content validity and structural validity, each of which approaches the question from a different angle. Prediction validity refers to the ability of the measure to describe some external phenomenon correctly. Apart from prediction of the future, the concept may imply here identity between the results obtained using two distinct measures (Alkula et al. 1995: 91), in which case one also needs a criterion, or comparative variable, on the basis of which the validity of the measure in question can be assessed. In practice, validity could be measured in terms of the correlation between comparative variables. Thus it has been possible to compare an index of communication ability with the amount of communication taking place, leading to the observation that such indices are consistent with the use made of communication.

Content validity is connected with the operationalization of abstract concepts. A measure is required to be rational and justifiable and to assess precisely what it is intended to assess. There is no quantitative indicator of validity in this sense, even though we are talking here of a fundamental basis for the evaluation of validity. According to Viherä, some of her indices are well justified in terms of content, while others are largely functions of appropriate variables. The connection and skills indices may be considered to be of higher content validity than the motivation indices.

The third type of validity, structural validity, may be said to be adequate if the results of the investigation are in conformity with prior assumptions and when the measure functions as it should within the investigation process as a whole. Viherä regards structural validity as being achieved fairly well in this case.

Viherä notes that it is useful to remember when examining the indices that most social phenomena are "more like liquids than solid matter". They are highly flexible and can sometimes alter rapidly as times and conditions change. Frequently the measures or indices have to be redefined after a change has occurred, and in such a case the compression of a large body of material within a few descriptive concepts can do much to increase understanding of the topic.

Reliability is concerned with random errors and can be increased by the use of parallel questions, for instance, and by ensuring a sufficient size of sample, so that answering errors acting in opposite directions will cancel each other out. Viherä estimated statistically that the reliability of her indices was good.

The indices are calculated as sum variables, which are suitable for a situation in which a set of intercorrelated variables are used to describe an abstract concept. Also, it is possible to weight the elements contributing to a sum variable so that one will influence the final outcome more than the others. This is done in the present case. The use of a sum variable increases the validity of the indices, as different aspects of the object of interest can be mapped with different contributory variables, and the reliability will increase as well, since summation of the values for the contributory elements will allow any random errors in these to cancel each other out and provide a more accurate result. The formation of the indices in the manner of sum variables will be described below, allowing the reader to make his own evaluation of the rationality of the variables used.

Selection of basic variables and formulae for the indices

Communication capabilities may be examined separately in terms of telephone and network communication, a division necessitated by the fact that communication by telephone is a traditional activity and people's abilities with respect to it may be assumed *a priori* to be better than for network communication, and are also shown to be so in the light of the interviews. Network communication is taken here to include both the Internet and Email, which are the most important forms of network communication as far as ordinary people's communication abilities are concerned. The indices of communication capabilities are calculated separately for these two components, and additional separate sub-indices of doing, organis-

ing things and belonging are calculated for the motive index, which is taken to be the arithmetical mean of the three. The interview data supplied more material for calculation of the access and competence indices than for the motive index, as there were only a few questions related to motives. These nevertheless allowed some calculations of an indicative kind to be made and some discussion of the nature of motives in the field of communication abilities in a society.

Access index of telephone communication capabilities

The variables contributing to the access index of telephone communication are the numbers of wired telephones and mobile phones possessed by the respondents and the occurrence of answering machines and audio frequency telephones and use of text messages, representing accessories to the telephone. An answering machine greatly increases the reachability of the subscriber. The variables involved as thus the following:

1. Possession of a wired telephone connection, estimated in terms of the number of telephone receivers in the household. The index was also affected by the number of household members relative to the number of telephone receivers.
2. Audio frequency capacity of the wired telephones. Reachability increases by 15% upon possession of an audio frequency telephone, as this permits the transferring of calls, three-ways negotiations etc.
3. Answering machines attached to wired telephones, which further increase reachability to some extent. This effect was estimated at 20%, on the assumption that every fifth phone call will go to an answering machine and reach the subscriber in that manner.
4. Possession by a household of a separate wired telephone at its holiday cottage, which again improves reachability and is indicative of a desire to be contacted.
5. Possession of a mobile phone.
6. Use of a mobile phone answering service.
7. Use of text message facilities.

The use of both a mobile phone answering service and the possibility for sending text messages received the coefficient 0.2, as these increase the facilities associated with the mobile phone. The balance between wired phones and mobile phones was adjusted by assigning each wired phone a weighting of 1 and each mobile phone 1.5. These weightings are enlightened guesses on the part of the author.

Competence index of telephone communication capabilities

Skills in telephonic communication were divided into two areas: a) technical mastery of the telephone, or "dialling skills", and b) mastery of the communicative situation. The first of these clearly applies to skills in the narrow sense, whereas the latter involves an element of a broader perspective. The telephone is nowadays a part of the basic set of tools which a Finnish citizen requires for everyday life and has an established position in the home and in people's personal use. People know how to make a telephone call and find numbers with the help of Directory Enquiries etc., i.e. they master the basic aspects of telephone use. Since 75% of the population report that they have a good or adequate mastery of the basic functions of their home telephone, a score of 0.8 was assigned to each individual for dialling skills as the foundation for telephone use, after which mastery of the additional functions was assessed on the basis of how many people claimed to manage these well or moderately well. The smaller the number of people who mastered a particular function, the higher the weighting assigned to it.

The second aspect of telephone communication competence, mastery of the communication situation, was assessed by means of the respondents' reactions to the following statements:

a) I readily pick up the phone and call someone.
b) I find it easy to phone strangers.

These questions describe both the way people act, i.e. how easy it is for them to make a phone call, and their attitude, i.e. whether it is easy to phone some-

one. Both of these statements fall into the category of communication susceptibility. The competence of telephone communication include the manner of making a phone call, choice of the right moment to phone and the technique of explaining what one wants. Only mastery over these aspects, combined with dialling skills, will suffice to describe telephonic skills as a whole. If a person reported making large numbers of phone calls and picking the telephone readily, he or she was regarded as mastering the situations referred to in the statements. The function defining the skills index of spoken communication assigns a weighting of 0.5 to each element, dialling skills and mastery of the situation.

Motivation index of telephone communication capabilities

The material contained relatively few variables concerned with motivation. Since it is in any case difficult to describe in terms of overt actions, an attempt is made here to describe it by means of variables denoting contacts and interests. Thus the motivation index was made up of three dimensions: to do, to organise things, to belong.

The part of the motivation index of communication capabilities describing association represented the sum of the variables:

1. Number of relatives seen fairly regularly.
2. Number of friends, acquaintances and associates with whom one is in constant contact.
3. Desire to remain up to date, i.e. to know what is going on in one's immediate circle.

These three variables received equal weightings in the index.

The part doing of the motivation index comprised variables describing motives for action in society:

1. Interest in matters affects one's immediate environment, i.e. reaction to the statement *"I am interested in things that happen in the immediate neighbourhood"*.
2. Readiness to represent one's fellow-citizens in the development of local authority services, i.e. reaction to the statement *"If I were chosen, I would be ready to represent the local people on bodies aimed at developing health and social services, for example"*.
3. Active participation in various organizations. Participation in at least one organization gained a score of 1.

All three variables received equal weightings in the index.

The organising aspect of the motivation index was described by means of:

1. The variable *"I enjoy chatting idly on the telephone about one thing and another"* was regarded as descriptive of analysis by means of deliberation. Things often become much clearer after chatting over them.
2. The reaction to the statement *"I am more interested in community and cultural affairs than in technology and technical equipment"* was chosen as the second variable of social awareness.
3. The second variable of social awareness was also represented by the reaction to the statement *"I am not interested in local politics"*.

All three variables were regarded as equally important.

The overall motivation index of telephone communication capabilities was obtained as a weighted average of the three sub-indices.

Access index of network communication capabilities

Separate indices were constructed for network communication, the access index in this case being composed of variables describing the equipment possessed by the household:

1. An ISDN connection.
2. Existence of a modem.
3. Parallel use of a portable telephone and a mobile phone.
4. Email and Internet facilities available at work or place of study.
5. An Email connection at home or elsewhere (outside work or place of study).

The index gives equal weight to home and leisure-time connections and to connections from work.

Competence index of network communication capabilities

The network communication competence index is composed of four contributory entities:

1. Digital dexterity, described in terms of the respondent's own experiences of the ease of using a keyboard and a mouse. A respondent should be able to write reasonably fluently with a keyboard and to use a mouse at least relatively well. The index of digital dexterity is calculated as the mean of these two variables and receives a weighting of 0.25.
2. The respondents were asked about their knowledge of English as a factor influencing the use of computers. They were expected to have a command of the language sufficient to enable them to use computer programs, even though some things might be a matter of guesswork. This variable also received a weighting of 0.25.
3. Technical skills were assessed in terms of whether the respondent was more or less able to load programs or download them from a network. This variable received a weighting of 0.2.
4. Skills in using communication programs such as an Email program or Internet browser were ascertained by means of the question "How well are you able to use the program?" The score was taken as being the mean of the two parts, and program skills were assigned a weighting of 0.3 in the skills index of network communication ability, i.e. they were regarded as more important than technical skills, language skills or dexterity.

Other aspects which could affect competence in network usage include an understanding of the working of the Internet, the ability of extract information from the Internet and assessment of the reliability of such information, but these were not ascertained in the interviews and therefore had to be ignored when forming the index.

Motivation index of network communication capabilities

The elements used in forming the index describing the motivation aspect of network communication capabilities were the same as for telephone communication capabilities, except that they did not include the statements *"I like to know what is going on in my circle of friends" and "I enjoy chatting idly on the telephone"*.

In the publications of Viherä (1999, 2000) the above indices are calculated for various sectors of the material defined by background variables, e.g. in terms of regions, the number of employed persons, etc.

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Three Years of the Information Society

A Longitudinal Survey of the Use Made of Modern Information and Communications Technology in Finland.

A report on the establishment of the mobile phone, computer and Internet as integral parts of everyday life in Finland, based on a panel survey of about 1200 people interviewed in 1996 and again in 1999. These unique results describe how the respondents' skills improved over the three years, how their opinions changed and how permanent the adoption of mobile phones and computers has been. They show that the mobile phone has succeeded in finding a permanent niche in people's everyday lives but that the computer and Internet have encountered many obstacles on the way.

The report begins with an assessment of attitudes towards the information society, after which it goes on to examine the adoption of the mobile phone as a tool for everyday life and the reasons why the computer and Internet have not fared so well. It then assesses trends in the communication abilities of the Finnish population. It is rare for research in the social sciences to achieve this degree of sensitivity in the analysis of changes, especially in the case of the information society, where developments occur with such speed.

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