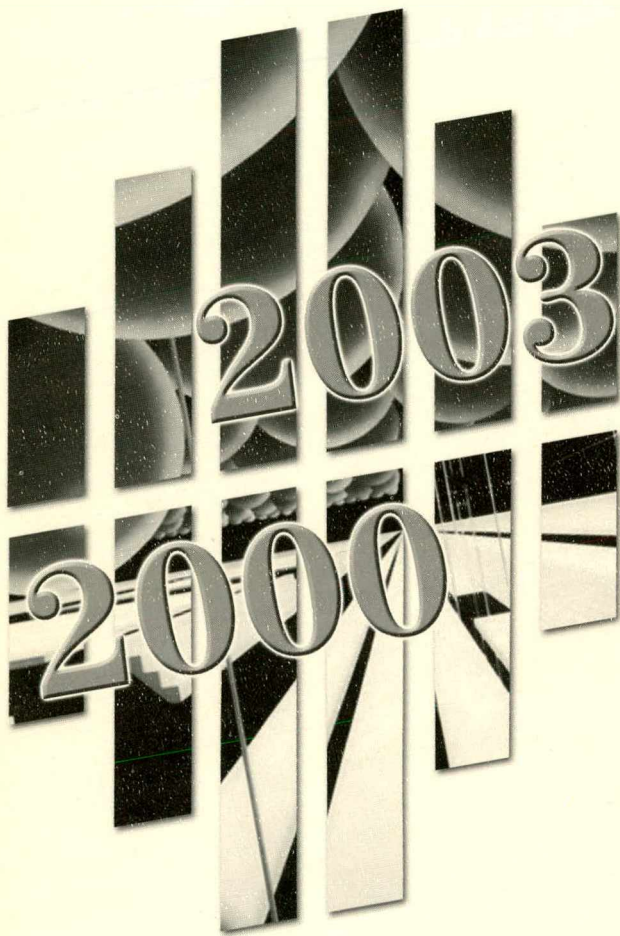


**STATISTICS FINLAND:
MAIN LINES OF RESEARCH AND
DEVELOPMENT IN 2000-2003**

REVIEWS



Statistics Finland

REVIEWS 2000/6

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DEVELOPMENT IN 2000–2003**



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Preface

The role of research and development in improving statistics production and the quality of statistics has attracted growing attention in recent years at many national statistical agencies. The increasing importance of research and development in supporting statistics production is also recognised at Statistics Finland. One of the major current and future challenges for the agency's research and development work is presented by the increased involvement in the European Community's research and development programmes.

Statistics Finland's first research programmes were published in 1994 and 1997. The third programme covers the period from 2000 to 2003. Building on the good reception and success of the earlier programmes, this Document aims to provide a more detailed description of the areas on which the agency shall focus its research efforts over the next few years. At the same time, the aim is to try and find the right niche for the agency on the domestic and international research scene; to clarify the agency's research profile and division of labour; to promote co-operation and networking with other research organisations; and to find new ways of doing and funding research. Special attention will be paid to the use of research results in statistics production.

This Document outlines the main lines of research and development that shall be pursued at Statistics Finland during 2000–2003. In other words, it provides a broad framework within which more detailed plans for specific research

projects can be discussed as part of the agency's ordinary operational planning.

The principles, strategies and concrete measures set out in this Document are aimed at maintaining high levels of research innovation and productivity at Statistics Finland. Scientific research supports the primary goal of statistics production: to provide up-to-date, reliable and high-quality statistics which meet the growing information needs of modern society. In addition to its concern with quality, research and development aims to improve the cost-effectiveness of statistics production and to promote critical but constructive debate on statistics production. Assuming that these issues have wider relevance, Statistics Finland wishes to make its experiences available – in the form of this Document – on the international scene as well.

The work to revise this research programme was co-ordinated by Statistics Finland's Scientific Advisory Board. Many outside experts were also consulted. The Document was compiled by Risto Lehtonen, Director of Research, and Timo Byckling, Secretary to the Scientific Advisory Board. Professor Carl-Erik Särndal (University of Montreal) contributed to the project during his six-month visit at Statistics Finland in 1999.

Research and other staff at Statistics Finland have been widely consulted in the preparation of this Document, which has been extensively discussed and reviewed before publication. I wish to thank all those people who have contributed to this project.

Timo Relander
Director General

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Summary

This Document broadly identifies the focal areas of Statistics Finland's research work in 2000–2003, providing an update to the former document for the years 1997–1999. The research programme for 1997–1999 brought together key lines of research pursued at Statistics Finland: research with a social sciences orientation, research with an economics orientation and research with a statistical sciences orientation and other methods research. The focal areas of research were defined on the basis of the agency's current strengths in research as well as its current development needs.

Research with a social sciences orientation will focus on the study of living conditions and welfare, the labour market and working life, income and consumption, adult education, time use, leisure, mass media and culture, information society and environmental issues, demographic research, and regional social statistics, as well as qualitative research methodology and the development of interview and questionnaire methods. In *research with an economics orientation*, focal areas of study include research with a macroeconomic orientation, industrial economics and the economics of innovation, environmental economics, regional economics and methods research, the latter including the development of the national accounts system and economic indices and indicators. Some areas of research will need to be tackled with a combination of different methods and approaches; examples are provided by the information society, environmental issues and trends of globalisation. *Research with a statistical sciences orientation and related methods research* concentrate on the statistical methodology of survey research and register-based statistics production, including study and sampling design, edit and imputation techniques, the use of

auxiliary information in estimation, small area estimation, the methodology of register-based statistics production, and statistical data disclosure methods. Other methods research related to statistical research includes studies of classification methods, information technology, and statistical quality work.

Networking with universities, research institutes and other statistical agencies both at home and abroad is the most important way of further strengthening those areas of research that can contribute most to the further development of production processes and services. Statistics Finland will maintain and further develop its networking procedures and research infrastructure.

In order to promote a stronger orientation to research, Statistics Finland shall provide further and supplementary training to staff members. Natural staff turnover offers a useful way of raising the level of scientific expertise in the agency. The agency must have a sufficiently large and competent research staff. Recruitment of outside experts on a temporary basis can help to speed up the creation of the necessary critical mass.

Applications for research funding shall be directed increasingly to outside sources, both domestic and international (particularly the European Union). Important outside sources of funding for research work aimed at the completion of post-graduate degrees include the Academy of Finland and various foundations.

Co-operation in research and development issues at European and international level is of growing importance. Many of the international research and development operations will be implemented under the umbrella of *The Fifth Framework Programme for Research and Development on the European Statistical System* (1998–2002).

I. Research at Statistics Finland and Research Co-operation

One of the basic requirements for statistical agencies today is to have the flexibility to respond to both current phenomena and longer-term statistical needs. As the clientele of statistical agencies continues to grow and expand, new demands are being imposed upon the products and services offered. Increasingly, the demand today is for tailored, analytical statistics and for information that can help customers resolve their problems. Rather than fragmented pieces of information, customers today expect statistical agencies to provide coherent, well-organised information and interpretations that can help them analyse and forecast trends in development.

The aim of research at Statistics Finland is to promote and support the production of high-quality, up-to-date and relevant statistical information for citizens, public authorities, business companies and other organisations in an easily accessible and understandable format. Research plays an important role in helping to describe, explain, understand and possibly predict social and economic change, as well as in generating new concepts and frames of interpretation. It also has a crucial part to play in ongoing efforts to further improve production processes, to raise the quality standards of statistics production and to cut costs through the introduction of new methods. New innovations inspired by research may help to create new products and services and improve existing ones. To achieve all this, research must have a sound

scientific and methodological basis and, importantly, it must be closely integrated into statistics production.

In its research work Statistics Finland shall concentrate on those areas that serve the agency's short-term development needs in statistics production (applied research, development work; see Appendix 1). Other important areas of research are those that can help to provide a better knowledge and understanding of the social and economic phenomena under study as well as a more robust methodological foundation for research work (applied research, basic research; see Appendix 1). For this reason research and development (R&D) should comprise not only work that is directly relevant to production processes and their improvement, but also work that has longer-term or more general benefits to the agency.

The focal areas of research at Statistics Finland have been selected with a view to making the best possible use of the agency's position as major producer of research material and the substance matter and methodological expertise it has achieved in that activity. The main focus is on research areas and issues that have broad social significance, particularly insofar as they are not adequately covered in other research environments.

As well as doing independent research, Statistics Finland will continue to establish research networks with university departments, research institutes¹ and other statistical agencies both at

1 Examples include the Government Institute for Economic Research (VATT), the National Research and Development Centre for Welfare and Health (STAKES), the National Public Health Institute (KTL), and the Finnish Institute of Occupational Health (TTL). Other important research institutes include the Research Institute of the Finnish Economy (ETLA), the Labour Institute for Economic Research, Pellervo Economic Research Institute PTT, the Research and Development Centre of the Social Insurance Institution of Finland, and The City of Helsinki's Department of Urban Facts.

home and abroad. This is an effective way of further strengthening those areas of research that can contribute most to the further development of production processes and services. Networking can provide an effective tool for spreading the risks – as well as the expenses – over different parts of the network. Recent examples of networking with university departments are provided by the joint R&D projects and other contractual co-operation with the University of Jyväskylä, University of Helsinki, University of Joensuu, Åbo Akademi University, and the Helsinki School of Economics and Business Administration.

In a joint R&D project, the division of labour between Statistics Finland and a university department or other partner is typically as follows: The necessary scientific research is usually carried out by university staff (possibly together with scientifically competent staff from the agency), the development work, including software development, is done jointly, and implementation – often the most demanding practical phase – is the responsibility of agency experts. There are several examples of the use of the networking approach in R&D projects from the previous three-year period (1997–1999) covered by the R&D programme: the implementation of stochastic population forecasting methodology; the implementation of hedonic methods for price indices; the development of small-area estimation procedures for social surveys; the development of statistical data disclosure techniques for GIS (geographical information systems) applications; the development of edit and imputation techniques for business surveys; productivity analysis in the input-output framework; and measurement issues in income and poverty research, just to mention a few.

Statistics Finland is increasingly involved in international research co-operation, especially

within the European Union framework. In the programme period, the agency will further develop its participation procedures especially in R&D projects of the European Union's Fifth Framework Programme for R&D. Important criteria for participation include compatibility with the agency's overall research policies and expected value added for agency statistics production with respect to quality, comparability and cost effectiveness.

For successful R&D, Statistics Finland will maintain and further develop its research infrastructure and networking procedures. These include long-term research contracts with universities and research institutes, procedures to provide access to data for research purposes, joint academic posts with shared funding, fellowship schemes that allow for scientific visits, scientific publication procedures, funds and procedures to support post-graduate studies in a variety of disciplines relevant to official statistics, and support for master's programmes in fields relevant to official statistics.

This Document broadly identifies the focal areas of Statistics Finland's research and development work in 2000–2003. Apart from the definition of the main lines of research and development for the agency, ongoing concerns include resource allocation, forms of research implementation, support and funding and the closer co-ordination of research and statistics production. Final decisions on resource allocation for individual research projects and further education shall be made separately each year.

A brief summary of the Finnish system of official statistics and of the functions and organisation of Statistics Finland is presented in Appendix 2.

2. Focal Areas of Research

Basic Classification of Research

A basic distinction is made between *substance matter research* and *methods research*. Particularly in new areas with important implications for society at large, the development of statistics production requires a more thorough knowledge of the phenomena on which the statistics are to be compiled. The best and most sensible way to collect the necessary information is to apply the approaches, concept apparatuses and methods of social and behavioural sciences and economics. On the other hand, statistical and other methods research serves many different areas of statistics production and empirical research. An important practical objective is to make the best methods available for production processes and research projects. Statistical science and related disciplines provide the main scientific basis for methods research.

The definition of the focal areas of *substance matter research* is based on assessments of the agency's current strengths in research and its research development needs. Moreover, the focal areas identified have been selected with a view to making the best possible use of the agency's position as a major producer of basic data for research purposes and the scientific and practical expertise achieved in that activity.

Research with a social sciences orientation shall focus on:

- living conditions and welfare;
- changes in the labour market and in working life;
- income and consumption differences, poverty and marginalisation;
- adult education and training, and adult learning;

- time use, leisure, mass media and cultural statistics;
- information society and environmental statistics;
- demographic research; and
- regional social statistics.

Research with a social sciences orientation also includes the provision of register data for scientific purposes, where an important aim is to further develop the Longitudinal Census File and the register of Regional Employment Statistics.

Demographic research with a social sciences orientation is needed in order to gain a deeper understanding of the dynamics of demographic phenomena. A further aim is to provide a more solid basis for the introduction of new, up-to-date methods for population projections.

Research with an economics orientation shall focus on:

- research with a macroeconomic orientation;
- industrial economics and the economics of innovation;
- environmental economics; and
- regional economics.

Methods research comprises research work with a statistical sciences orientation and related methods research. It also comprises other methodologically-oriented research, which is mainly carried out in connection with research into social and economic phenomena.

Focal concerns for *research with a statistical sciences orientation and related methods research* include:

- study design and sampling design;
- edit and mass imputation;
- the use of auxiliary information in estimation procedures;

- domain estimation, including small area estimation;
- the methodology of register-based statistics production;
- statistical data disclosure methods;
- classification methods;
- information technology; and
- statistical quality work.

Methodologically-oriented research into social and economic phenomena is chiefly concerned (in the field of social sciences research) with the development of methods for collecting survey data and (in the field of economics research) with the development of indices and indicators.

In many of the research areas discussed below there has already been significant research activity, others are new, emerging areas. In each case brief mention is made of the most important ongoing or proposed research projects.

Research into social and economic phenomena and statistical and other methods research are discussed separately, even though in practice they are closely related.

Research with a Social Sciences Orientation

Following is a list of key areas of research into social phenomena. A basic requirement for the production of relevant social statistics is a thorough knowledge and understanding of the social phenomena concerned. Carefully targeted research with a social sciences orientation aims at the provision of this information. For sufficient coverage of the important areas, Statistics Finland will carry out independent research and conduct joint research projects with university departments, research institutes, government bodies and other relevant partners.

According to the Lisbon summit (Lisbon European Council, March 2000), the importance of social statistics in the European Statistical System can be expected to increase. There is a de-

mand for a comprehensive, integrated and harmonised system of social statistics as a central part of the European Statistical System. The development of this system requires purposive R&D actions. Many of the international R&D projects in this area will be conducted in the context of the EU's Fifth Framework Programme for R&D. Statistics Finland will be closely involved in this process in order to contribute to the development and to benefit from the results.

This is the framework on the basis of which decisions are made each year on the focal areas of research and resource allocation to individual research projects:

a) Living conditions and welfare. Statistics Finland has traditionally played a major role in describing and monitoring the population's living conditions. It is important to have several different indicators to follow the impacts of economic trends on welfare in Finland and its underlying factors: this requires frequent and regular measurements of living conditions, income, wealth and consumption. Information is also needed on non-material living conditions: social relations, changes in way of life and marginalisation. There is also increasing demand for reliable and internationally comparable data on living conditions and welfare, e.g. in the framework of the European Statistical System in social statistics.

The material collected for the *Living Conditions Surveys* in 1978, 1986 and 1994 has been widely used for the production of social statistics and for research in social sciences. Partly funded by the European Commission, the *European Community Household Panel (ECHP) Survey* (which started in Finland in 1996) will provide new data for monitoring living conditions and for international comparisons of welfare. These data will be particularly useful for example in longitudinal studies of dynamic social processes, such as social inclusion/exclusion and marginalisation, and their determinants.

The ECHP Survey will be completed in 2002. Statistics Finland will be involved in the

planning of a new European living conditions survey, which is due to start up in 2003. In addition to providing comparable data in the European context, the new survey is expected to meet national needs for the regular monitoring of living conditions.

The development of a new instrument for monitoring living conditions requires an international research input. Statistics Finland is involved in methodological research projects in the context of the EU's Fifth Framework Programme for R&D, such as the Chintex (Change from input harmonisation to ex-post harmonisation in three national samples of the ECHP, 2000–2002), co-ordinated by Statistisches Bundesamt, Germany, and a research project on the comparability of income data, co-ordinated by Statistics Norway. As part of these international operations, Statistics Finland will be continuing to work closely with Åbo Akademi University in its studies on income comparisons as well as methodological issues in the measurement of welfare.

In response to the substantial demand for information on the *living conditions of children and youths*, Statistics Finland will continue work within a research project that has recently been launched in this area. The purpose is to continue the analysis and reporting according to the recommendations of Statistics Finland's youth research working group concerning the broader utilisation of data on young people in Finland.

Statistics Finland is involved in an extensive *National Health Examination Survey 2000* co-ordinated by the National Public Health Institute. In addition to collecting the necessary interview data, Statistics Finland will contribute to methodological development. The survey will provide invaluable research materials for monitoring the health of the Finnish population. Data collection on accidents is organised within the framework of the EU's EHLASS/HLA system.

Another line of research under the general heading of living conditions and welfare is represented by *safety and victim studies*. General safety in the population has been described by

Statistics Finland on a regular basis since 1980. Statistics Finland has also taken part in the International Crime Victim Project. Safety and victim surveys measure the occurrence of accidents in the workplace and in the home, in traffic and in sports and other leisure activities; fear of crime and falling victim to crimes; and the precautions people take against becoming a victim. Statistics Finland will continue research in this area as part of its regular social reporting.

Many European countries and statistical agencies have compiled special social reports to describe and evaluate the development of living conditions. Statistics Finland shall also invest greater effort in this line of research and social reporting. During the programme period, it would be necessary to produce a new reporting system on "*Social Trends*", comprising both a regular research publication and a database in Statistics Finland's *StatFin2000 System*, a major Internet-based dissemination tool. These new instruments will cover the core areas of social statistics and supplement the social reporting carried out in the agency's journal *Welfare Review* (Hyvinvointikatsaus), which is published quarterly.

b) Changes in the labour market and in working life. Questions related to the labour force, unemployment, working conditions, the quality of employment relations, i.e. the concept of work in its various contexts, constitute an important social policy issue that requires continuous research attention. Changes in the labour market and qualitative changes in working conditions have a major determining impact on welfare. Indeed research into various aspects of working life is closely interwoven with many topical problems, such as marginalisation, the interplay between social policy and work, the question of how employees cope with the stresses and strains of work and in general with the requirements of the world of work.

An important research tool in this area is the *Labour Force Survey*, which is conducted regularly on a monthly basis. The survey has been

recently re-designed to meet the requirements of the current Community regulations. Methodological R&D will be carried out to monitor the performance of the instrument and to develop new products based on the materials produced by the survey. The Labour Force Survey provides valuable information on changes in employment, working hours, unemployment as well as the links between work and such factors as ageing, education and migration. Various ad hoc modules will be incorporated into the Labour Force Survey as necessary: these deal with such topics as Training and the labour market (in 2000), Length and patterns of working time (in 2001), Employment of disabled people (in 2002) and Lifelong learning (in 2003).

Quality of Work Life Surveys in the wage-earning population (conducted in 1977, 1984, 1990 and 1997) represent a significant source of research material on *working conditions*. The surveys are funded jointly with outside organisations, and they provide materials on the basis of which it has been possible to study long-term changes in working conditions. The material is extensively used by both Statistics Finland's own research staff (in the Working Conditions Research Unit) and outside researchers. Among the topical issues covered in this area are the links between labour market status and working conditions, pressure in the workplace and the uncertainty of employment, gender equality in working life, the significance of age at work, changes in the organisation of work, new management strategies and their impacts, the changes caused by information technology and international comparisons of working conditions. Qualitative and quantitative research approaches are often combined in research projects. To continue regular reporting on working conditions and their development, Statistics Finland plans to conduct a new survey during the programme period. Steps will also be taken to promote international networking in research on working conditions.

c) Income and consumption differences, poverty and marginalisation. The basic material collected each year for the *Income Distribution Statistics* offers a solid foundation for monitoring and analysing the economic status of different population groups. In the measurement of income distribution and the monitoring of changes in income distribution, extensive use is made of register data in combination with interview data. The so-called service data sets extracted from the basic material are an important tool both for scientific research and for planning and decision-making concerning income equality issues. These data sets are widely used by researchers at universities and research institutes.

The income distribution material is also used in international projects, and it allows for comparisons through data sets compiled in the *Luxembourg Income Study* (LIS), for instance. Statistics Finland will be working to expand the applicability of this extensive material. One of the areas where it may prove useful is in the *study of over-indebtedness and financial difficulties* as measured by subjective and objective criteria.

The material collected for the *Wealth and Property Survey* in 1999, combined with earlier materials from 1987/88 and 1994, provides a useful source of information for scientific research and for monitoring changes in economic inequality between population groups. The relationship between income distribution and wealth provides one of the broad research topics that will be addressed.

The purpose of the *Consumption Survey* (formerly known as the Household Budget Survey) is to describe the changes taking place in society by reference to material welfare and consumption habits. The most recent survey was taken in 1998; the next will be carried out in 2001. The weight structure of the consumer price index has been revised at regular intervals on the basis of the information produced by the Consumption Survey. This information has been extensively used for various research purposes, mainly in social policy distribution studies, but

also in economic demand surveys, sociological way-of-life studies, nutrition studies as well as studies in social history. Furthermore, the material collected in the survey is used in poverty research (e.g. minimum income, reasonable consumption) in conjunction with the European Community Household Panel and income distribution data. Topical research themes in the Consumption Survey include comparisons of income and costs structures, the effects of economic recession, time use and consumption, internal decision-making and resource distribution in households, the impacts of incentive traps on the supply of labour, service availability, consumption and social networks and the environmental perspective on consumption. The ad hoc modules incorporated in the Consumption Survey help to broaden the perspective and throw more qualitative light on consumption. There are plans to carry out methodological R&D in connection with the planning and implementation of the new Consumption Survey.

d) Adult education and training, and adult learning. The *Adult Education Survey 2000*, funded by the Ministry of Education, is the fourth in the series of surveys on adult education and training conducted by Statistics Finland. The survey is a co-operative effort of Statistics Finland and university researchers. In 1997–2000 the agency carried out the *Second International Adult Literacy Survey* (SIALS), also funded by the Ministry of Education. The survey has been conducted in co-operation with the Institute for Educational Research (University of Jyväskylä). The results will be reported in a co-operative Nordic project.

An international EU-funded *Continuing Vocational Training Survey* (CVTS) will produce detailed information on training costs and expenditures, the commitment of business firms to human resources development, their training policies and employers' attitudes towards education. Statistics Finland, together with 24 other European countries, will be collecting data from enterprises during 2000.

In these surveys Statistics Finland will collect information from both employees and employers concerning the extent of formal and informal training at work. One of the concerns will be to look into differences in reporting on training activities between these two sources. In this area the agency will work closely with Statistics Sweden. Statistics Finland will participate in the international development of harmonised concepts and comparable indicators of lifelong learning, formal and informal education and training, measurement skills, etc.

e) Time use, leisure, mass media and cultural statistics. Statistics Finland played a key part in planning the EU-harmonised *Time Use Survey* on account of its expertise in questions of substance and methodology. Methodological work has been carried out in a EU-funded R&D project. The data collected for the Time Use Survey in 1999–2000 provide useful research materials on a number of different themes: time used in wage labour, informal work, equality, traffic, culture and leisure, sports and physical exercise, time use among the unemployed, the rural-urban dimension, etc. The survey results will show how working time has changed and whether people are working more often during evening or night shifts and during weekends, for instance. The materials collected for the survey will be widely used for research purposes and for social reporting by Statistics Finland staff and partners who have participated in the funding of the project.

As far as unpaid work is concerned, a focal concern is with the measurement of household production, i.e. the amount of work that is done in private households, help provided to other households and voluntary work. Statistics Finland has created a model for satellite accounting of household work. Information on how wage employment and housework are divided in families is needed for purposes of equality and family policy planning. Social policy planning, for its part, requires information on how care is pro-

vided for children, the disabled and the frail elderly.

There is a demand for up-to-date information on leisure activities and everyday activities. Will we see an evolution of new forms of community, how will the relationship between different media change in everyday life, how will people's choices of media contents change, will the existing differences between men and women in these choices be retained, will the genders drift further apart from one another, how do leisure activities influence coping? All these questions are directly relevant to the ongoing changes in people's living conditions. The *Leisure Survey* has traditionally employed a combination of quantitative and qualitative methods. A new leisure survey will be carried out during the programme period. Planning for the survey will be done in co-operation with university researchers and experts from research institutes and other organisations.

As regards *statistics on culture*, interesting research topics include the concepts of cultural policy, culture and the third sector as well as culture production and the economy. Information technology, telecommunications and the mass media represent a growing consumption item and are major life-style determinants. During the term of this programme research will be carried out on changes in the structure of mass media ownership, the concentration of ownership, the impacts of new information technology and the role of the audio-visual sector as an employer.

f) Information society, environmental statistics, barometers. The information society is one of the most common catchwords in the media today and in contemporary public debate more generally. It is important that up-to-date information is made available on the development and social dimensions of the information society. Statistics Finland has so far produced two extensive reports on the subject.

In practice the transition to the information society is taking place at the individual level through the adoption of new information and

communications technology and the use of these technologies in the home, in the workplace, at school and during leisure. For this reason it is important to conduct surveys on the frequency of use, on people's experiences with these technologies and on their attitudes. Data collected in *surveys on the use of information technology* (1996, 1999) help to shed light on how things are changing and where we are heading. Together with the material collected for the Time Use Survey, this provides interesting angles on the significance of information technology in the life of young people. The question of the relationship between new technology and users has also been raised within the European Union. One of the priorities of the programme period will be to conduct further interview studies on these issues.

Given the rapid pace of change in modern society, there is a constant demand for barometer-type studies to measure consumer attitudes and expectations, gender equality issues, etc. Consumer decisions and expectations are increasingly important market determinants, and consumer and environmental policy is assuming ever greater importance alongside traditional social policy thinking. The *Gender Barometer* is one of the items in the Finnish Government's Plan of Action aimed at the promotion of gender equality. The Gender Barometer measures the experience of gender equality among Finnish women and men, with special reference to personal relations, social collectivity in the workplace and society. The first extensive interview survey was published jointly by Statistics Finland and the Council for Equality in 1998. The purpose is to make it a regular series.

Environmental attitudes lend themselves ideally to measurement in sample surveys. Statistics Finland has worked closely with universities in examining the *environmental attitudes of Finnish people and their energy consumption*. To see how the ecological ties in with the social, we need to have a broad interdisciplinary research approach which looks ahead to the future; and that, in turn, calls for joint projects be-

tween environmental studies with a social sciences orientation and environmental economics. Statistics Finland is exceptionally well placed to satisfy the growing information needs in this area.

g) Demographic research. The main purpose of demographic research is to provide an up-to-date description of the demographic structure of society and how it is changing. In addition to traditional population statistics, Statistics Finland also produces population prognoses and compiles new life expectancy tables each year. The agency has also done demographic research on migration, fertility and mortality. In the years ahead a special effort will be made to produce data sets on family formation and fertility. These registers will partially replace the data that have been collected in demographic surveys. In addition, work will be continued to further develop the methodology of population prognoses and the reliability of these prognoses. In this area the agency has close co-operation with researchers from the universities of Helsinki, Tampere and Joensuu. Given the important role that Statistics Finland plays not only in the production of statistical data but in the use of register sources, the agency is certainly an attractive proposition for outside researchers and research institutes as a partner in co-operation.

h) Regional social statistics. Finnish register-based databases on the population, including geo-coded data on buildings, provide a useful source for the production of regional statistics on socio-economic issues. Work will be continued to produce regional statistics within the context of geographic information systems (GIS) in co-operation with university departments and research institutes. Statistical data disclosure methods will be developed and applied for better privacy protection in sparsely populated areas. Research in this area will be continued with the University of Jyväskylä. Research for the harmonisation of regional statistics in terms

of standardised area units and their coding system will be carried out in co-operation with other Nordic countries and Eurostat.

i) Application of qualitative research methodology. The combination of qualitative and quantitative research methods in the same survey system provides a fruitful approach for survey research. In the Quality of Work Life Survey, for instance, qualitative data collected from a group selected on the basis of the questionnaire survey are used to substantiate interpretations drawn from the results. The survey that combines qualitative and quantitative methods offers a number of benefits. For example, it allows for research into new phenomena, concepts and theories; helps to formulate more diversified questions and interpretations of the results; brings the results closer to everyday life, subjects' activities and experiences; and facilitates the description of change. The combination of data collection methods not only improves the questionnaire design, but can also provide information that is useful in the further interpretation of the responses. Qualitative interviews can be conducted in a questionnaire design, but qualitative data can also be collected later on from a group selected on the basis of the survey.

j) Development of interview and questionnaire methods. Research can contribute to the development of survey methodology in a number of different areas. These include methods of data collection such as CATI (Computer Assisted Telephone Interviewing) and CAPI (Computer Assisted Personal Interviewing), procedures for pre-testing questionnaire items, other evaluation methods and survey integration.

Launched on a permanent basis in 1999, the *CATI Centre* at Statistics Finland provides a good platform for methodological work on many aspects of the survey process, such as monitoring interviewer performance, running experimental tests on question wording, studying the effects of mobile phones on survey participation and evaluating the cost-effectiveness of running

mixed-mode surveys. The experiences are valuable in improving coverage and measurement in telephone surveys, but also in enhancing the quality of interviewer performance.

The *Survey Studio* is another recent addition to Statistics Finland's tools for improving survey quality. Apart from the traditional questionnaire testing procedure, new cognitive methods can be fruitfully used to analyse the response process. The system of testing questions, which focuses on the response process and on the interaction situation, provides the basis for improving the quality of measurement. This will provide a more solid foundation for the development of data collection processes in the statistical units, for the improvement of questionnaires and for testing special questionnaire items. To fully benefit from the new instrument, the infrastructure and operation of the *Survey Studio* will be substantially developed during the programme period.

k) Provision of register data for scientific purposes. The scientific use of Statistics Finland's extensive statistical data files is well-established. For instance, the Longitudinal Census File for 1970–1995 that is supplemented every five years, the large sample file of the 1950 census, and the 1987–1998 longitudinal file that is based on the annual register of Regional Employment Statistics are all extraordinary research data files, even by international standards. Numerous samples have been drawn from these total data files and released for research purposes. Since these files can be complemented with data from other sources – for instance registers and administrative data files – they are well suited for a wide range of research purposes. There is close co-operation between Statistics Finland and universities and research institutes to promote the use of data from statistical registers for research purposes.

Many individual-based data files are today derived from registers and administrative records. The special characteristics of these registers, as well as any changes in these character-

istics, are obviously reflected in the statistical data compiled from them. The increased use of data from registers both for compiling statistics and for research purposes means that it is essential to study in more detail the special features of register data, the comparability of these data and related issues.

It is the intention of Statistics Finland to develop the above mentioned longitudinal data files for greater coherence, comparability and improved quality, and in this way ultimately to increase their use in research. The aim is also to produce information on the nature and quality of register data and their use as sources for statistics production. There are two reasons why such knowledge is important: it helps Statistics Finland in its own quest to increase awareness of its data and the quality of these data, and it can also help to promote proper usage of sample data and statistics in social research. In short, the objective is to support and facilitate research, without forgetting the ethical requirements involved in creating data files and privacy protection.

Research with an Economics Orientation

With the changes that are continuing to sweep society and the growing information needs of clients, there is mounting pressure to improve and develop economic statistics. The research effort on economic phenomena concentrates on those areas in which there are close links of co-operation with other research organisations, or in which such links are being established. Increasingly, economics research is carried out in the context of joint projects. For these projects to work successfully, Statistics Finland must make a sufficient research input of its own. This is the framework on the basis of which decisions are made each year on the focal areas of research and on resource allocation to individual research projects:

a) Research with a macroeconomic orientation. Macroeconomics oriented economic research is concentrated on the national accounts system and is aimed at improving its quality. It includes the *development of national accounts and labour accounts* as well as empirical macroeconomic analysis of productivity and growth.

During the next couple of years the development of national accounts will be centred on the integration of the supply and use tables into the industry and sectoral accounts. This will improve the quality of the estimates both in national accounts and in input-output tables.

Statistics Finland has recently launched a project for the development of labour accounts. The aim is to improve estimates of labour input and labour compensation in the national accounts by systematically combining all the data that are available in different source statistics. Better estimates of labour input can be used to check other national account estimates, and they also provide a more reliable basis for productivity estimates based on the national accounts.

For some years now the agency has been publishing productivity reports, which include productivity estimates based on the national accounts and related statistics.

Over the next few years *empirical macroeconomic analysis of growth and productivity* will be developed towards the KLEMS (capital, labour, energy, materials and services) growth accounting approach. An important innovation of this methodology is that intermediate, capital and labour inputs are treated symmetrically. It also takes account of the fact that these inputs consist of components that differ in marginal productivity.

Further work is still needed to develop the KLEMS growth accounting approach; this applies most particularly to the methods used in estimating capital stocks and rental prices of capital. Time series of intermediate inputs will be estimated using existing input-tables as benchmarks. Labour input and labour compensation in national accounts will be broken down

at least by level of educational attainment. Statistics Finland has recently joined an international network for research on international productivity comparisons based on the KLEMS approach.

Productivity analysis in the input-output framework will gradually be extended to take into account intangible investment both in human capital and in R&D. Further applications of productivity analysis in the input-output framework will deal with such topics as the productivity of vertically integrated industries and the productivity effects of outsourcing in services, for instance. The input-output methodology will also be applied in research on intersectoral technology spillovers.

Empirical analysis of productivity and growth based on macroeconomic data, together with productivity analysis based on microeconomic data and research into R&D as well the development on hedonic and economic index methods, constitutes an entity in which work carried out in different areas of Statistics Finland's research programme can produce significant synergy benefits.

b) Industrial economics and the economics of innovation. Industrial economics includes *research on enterprise demography, research into enterprise subsidies, cluster research and micro-economic analysis of firm performance and employment*. The economics of innovation includes the Schumpeterian tradition, such as evolutionary and institutional approaches as well as neo-classical economics of innovation and technology. One of the key areas of research on industrial economics is represented by long-term empirical research at the business unit or enterprise level. This also applies to other research at the statistical unit level, such as municipality research based on coherent data sets.

Studies on the role of technology have recently emerged as a significant area of economics research. Among the main concerns of tech-

nology research are R&D, innovation and patents.

Key areas of *research into R&D activities* include the performance effects of R&D, assessment of the effects of R&D subsidies, and the relationships between profitability, R&D and human resources (training, staff structure).

As for *research into innovation*, key interests include the relationship between product and process innovations and firm profitability; the characteristics of innovative firms; factors promoting and prohibiting innovation; and methodological issues related to the measurement of innovation. Topical issues in *research on patenting* include company patenting behaviour, the characteristics of firms with a high level of patenting activity and the relationship between patenting and business profitability. Close co-operation with research institutes and researchers at home and abroad is crucially important with regard to the continued success of technology research.

Examples of research in industrial economics include a project on productivity trends in the manufacturing industries, which is based on enterprise-level data. This project is also concerned to evaluate the quality of the industrial statistics used in the project. There are also plans to carry out a research project on the impacts of information technology and staff competence on productivity in manufacturing industries and on the creation of new jobs.

A R&D project concerned with the measurement of productivity in the public sector proceeds from the micro level to the macro level. The measurement of productivity trends in local government makes use of existing statistical sources; the applicability of these data for this purpose is also evaluated.

Most of the projects mentioned above shall be entirely or partly funded from external sources.

The information society and its economic effects is a new area of research which is related to industrial economics. Research on the information society has three main aims: to better

understand the changes going on in society, to better understand the technical, economic and social conditions and consequences of those changes, and to provide relevant and up-to-date descriptions of those conditions and consequences. Statistics Finland is taking part in the efforts of the OECD and Eurostat to develop a framework and indicators for the changing society.

c) Environmental economics. Statistics Finland is a major producer of information on the interaction between the environment and the economy. The aim of the agency's ongoing environmental accounting is to develop systems that will combine both environmental and economic information. The development of environmental accounting is closely related to the implementation of a sustainable development policy. The extensions to the national accounts covering natural resources and the environmental impacts of industrial production provide a measure of how well the policy of sustainable development is being implemented.

An important area in the field of environmental economics is to develop statistical tools which integrate administrative and survey data on specific environmental issues. This will improve the applicability of environmental statistics and accounting for decision-making and policy-making purposes. New material flow models and accounts developed for the analysis of environmental data can serve as an early warning system of unsustainable processes and provide long-term scenarios for the future.

R&D in the field of environmental economics at Statistics Finland comprises scientific research aimed at new solutions and at practical applications of existing solutions. For the localisation of existing international environmental accounting systems, such as the United Nation's SEEA and the NAMEA which is promoted by the European Union, research is needed on these systems' theoretical premises and definitions, the coherence of the underlying data sets, and the pricing of environmental resources. Re-

search in these areas will be continued and intensified.

Statistics Finland has been engaged in projects on the eco-efficiency and measurement of sustainable development, the accounting of environmental expenditures, outputs and finance, forest accounting, the revision of the SEEA manual, NAMEA, and the use of input-output analysis in environmental accounting. Research in environmental economics will be concerned with the development and implementation of the SEEA accounts, material flow analysis and modelling, eco-efficiency and indicators of material consumption, as well as methods of valuing environmental resources and the benefits they offer. The results of the Finnish efforts on environmental accounting have been used in several international development projects within the European Union. Further links with other international research partners are still to be established. On the domestic front contacts have been tied with universities, government research institutes and ministries involved in research in the field of environmental economics.

d) Regional economics. The significance of the regional dimension in social statistics has increased considerably since Finland joined the European Union. An important aspect of the intensification of regional research at Statistics Finland will be the agency's involvement in joint projects as well as its closer co-operation with universities and regional research institutes. At the same time, work will be stepped up to develop information systems for the description of regional economies as well as methods to support regional research.

Statistics Finland has been involved in a research project concerned with the regional effects of the public economy. The aim has been to apply a model based on the theory of equilibrium to analyse the regional effects of the public sector. Statistics Finland has been centrally involved in the development of this model.

Analysis of the *structure of regional economies and the interaction between regional*

economies is an important ongoing project in regional research. Input-output analysis is a significant component of the project: regional input-output tables make it possible for researchers to adopt a new approach to studying the structures and effects of regional economies. A major joint project is under way in this area, involving among others the University of Oulu and the City of Helsinki Information Centre.

Finland's membership of the European Union has given added urgency to the need for new and better methods of measuring and collecting information on regional development: these are needed for the preparation of EU regional development programmes and for the evaluation of those programmes. Importantly, a new indicator system is needed for the description of regional economic and community structures as well as regional development. Tools are also needed so that changes in regional development can be followed up more quickly. Research will play a crucial part in developing the contents and the production of rapid-response indicators of (cyclical) regional development. For instance, the accuracy of indicators must be improved, and sample-based data sets need to be complemented with register data.

e) Methods-oriented economics research. Methods-oriented economics research provides the tools that are needed for the description of society and changes in society. This area of research comprises the development of national accounts and environmental accounts systems, the measurement of the value of domestic work, micro-macro links and the development of different kinds of indices and indicators. Indicators and standardised frames of description are needed chiefly for purposes of economic, social and environmental policy planning and for international comparisons.

Fixed-price calculations based on different kinds of descriptive, hedonic or economic index methods are an important development priority over the next few years and will require a significant research input. Focal research areas in-

clude the real estate market, the measurement of inflation and the labour market. Methodological problems that these research areas share in common shall be tackled by a method based on hedonic regression. Several research projects are currently under way or in preparation in this area, involving both international co-operation and post-graduate studies. The projects will be carried out jointly with universities, research institutes and other organisations. Co-operation has been started with the University of Helsinki, for example.

In the field of *labour market research* work is under way to establish the feasibility of an index to describe trends in labour costs. The index will be incorporated into wages and salaries statistics. Feasibility studies are looking at whether and how existing sources can be utilised and at how the quality and quantity of labour input can be standardised for the index (both as a theoretical and practical problem). In this area there is growing international co-operation in the context of Eurostat-driven task forces, for instance.

Research with a Statistical Sciences Orientation and Related Methods Research

Research with a statistical sciences orientation is concerned primarily with the development of powerful statistical methodologies for better statistics production. The practical goal of research in this area is to produce and implement up-to-date, scientifically valid methodological solutions for statistics production and for empirical research purposes. The attainment of this goal will require a long-term research and development effort, including applied and basic research in statistical science. Most of this work is carried out in the Statistical R&D Unit in co-operation with university departments of statistics as well as with the statistical units of the agency. Recently, many of the activities in this area have been carried out in international research projects.

The development of statistical methods for sample surveys is an important priority because many regular and expensive statistics production processes are based on sample surveys. The purpose of statistical research on survey methods is to develop and introduce statistical methods that are cost-effective and that can help to improve the reliability of survey estimates. These methods are needed in various areas of statistics production and empirical research, both in social surveys and business surveys. Statistics Finland has strong research traditions in this field. Research has been carried out in co-operation with university departments at home and abroad, and with other statistical agencies.

Statistical R&D is a high priority within the EU, Eurostat and national statistical agencies. This is clearly evident in the EU's extensive R&D programmes (DOSES 1989–93 and DOSIS 1994–98) and the current Fifth Framework Programme (1998–2002).

The focal concerns of *research with a statistical sciences orientation* are with the study designs and sampling designs needed in sample-based statistics production and empirical research, statistical estimation and analysis procedures, and statistical data disclosure methods. Other important areas of research geared towards the development of statistics production are those of classification methods, information technology and statistical quality work.

Focal concerns of research with a statistical sciences orientation include the following:

a) Study design and sampling design. Many sample-based statistics and research projects require complex study and sampling designs which include a panel design as well as multi-stage and multi-phase sampling. Complex designs of this kind are becoming increasingly common both in social surveys and business surveys. Therefore, important areas for methodological research include the *development of panel and rotation designs and sampling designs for complex surveys*.

A new user-friendly system for household and individual-based sampling will be constructed during the programme period. The system will provide a frame population for different sampling schemes, a source of auxiliary information to be used in sampling and estimation, and a platform for methodological research in survey sampling.

To co-ordinate data collection from companies, institutions and business units and to reduce the response burden, research has been successfully carried out in *efficient sample co-ordination methods*. In this connection, research is also needed into the *methods of enterprise demography*, which is a new area of work that falls partly within the domain of methods-oriented economic research.

b) Edit and mass imputation are important areas of research especially with regard to the quality of statistics based on business surveys and registers. Since administrative data do not generally include all the information that is required for statistics production, there may be a very great need for mass imputations, particularly in business statistics. For example, business surveys are usually focused on larger enterprises, and for smaller business firms, administrative registers complemented with imputed values for missing items are used. The practical benefits from research work in this area are considerable in terms of improved quality and reduced response burden.

Edit and imputation should as far as possible be carried out using a so-called general system developed for this purpose, i.e., a system that provides uniformity across all surveys within the agency. Generalised software for edit and imputation is available in some statistical agencies (e.g., Generalized Edit and Imputation System, GEIS, Statistics Canada). Statistics Finland is currently working to standardise procedures and to implement a general system for edit and imputation. There are also substantive international research activities in the EU context in this area. Research on edit and imputation tech-

niques will be partially based on experiments involving alternative ways of carrying out these operations.

c) The use of auxiliary information in estimation procedures. Statisticians and researchers using survey methods resort increasingly to register-based auxiliary information in order to improve the accuracy and efficiency of their estimations. For this reason an important concern in statistical methods research is to further develop the *methods of using register-based and other auxiliary information in estimation procedures*. At the same time empirical and simulation studies are needed to analyse the statistical properties of estimators and their variance estimators. Other areas of research include methods of assessing and adjusting errors due to non-response and frame problems as well as measurement errors in sample surveys.

An important distinctive feature of the Finnish statistical infrastructure is that it allows for the merging of register data with survey data at a micro level by using personal identification numbers (social surveys) or enterprise identification codes (business surveys). These identification keys are unique in both survey and register data sources and are important for the effective use of the auxiliary data available in estimation procedures for both social and business surveys.

An important goal in the quality improvement of estimation procedures is to standardise the methodological solutions used in estimation. Several advanced statistical agencies are using this kind of software package, such as Statistics Canada's GES (Generalized Estimation System). The introduction of such a package at Statistics Finland requires a close examination of the statistical methodology related to the software.

d) Domain estimation, including small area estimation. *Domain estimation* refers to the estimation of statistics for subgroups of the population. These non-overlapping subgroups can be

local areas, demographic groups, socio-economic groups, industrial classifications, or a mixture of these. National statistical agencies, including Statistics Finland, have seen a growing demand for domain estimates, especially for regional domains.

Small area estimation represents a particular type of domain estimation. Statistics especially for regional domains are increasingly needed for regional and local monitoring of important social and economic phenomena such as unemployment, income, poverty, and welfare in general. Domain estimates are occasionally used for the allocation of governmental and EU resources to local areas. Some domains for which statistics should be produced can be such that only a small number of sample elements are available in a survey data set. Estimation for small domains also requires the use of estimating approaches and techniques specifically developed for these purposes.

In recent years considerable efforts have been invested in developing methods for domain estimation. For estimation purposes auxiliary information on the population is usually available from statistical and administrative registers. The auxiliary data available, in combination with carefully selected statistical models, can be effectively used in an estimation procedure to adjust for bias and for better efficiency. So-called generalised regression estimators (GREG) are widely used for this purpose under the design-based model-assisted approach, and certain new developments have been introduced in the agency. These include so-called multilevel-model assisted GREG estimators and logistic GREG estimators. The statistical properties of the various estimators will be examined further. In addition, the properties of various model-dependent methods for small area estimation will be examined. Research in this area is carried out jointly with university departments of statistics (e.g. Universities of Montreal, Southampton, London and Jyväskylä as well as the Office for National Statistics, ONS, UK). A

R&D project under the Fifth Framework Programme is under consideration.

The main aim of research in small area estimation is to develop and implement reliable and efficient estimators for regional estimation purposes. The methods are intended for use in the regional estimation of employment and unemployment figures in the Labour Force Survey, and further, for selected social surveys (e.g. Consumption Survey and ECHP Survey).

e) The methodology of register-based statistics production. Research into the methodology of register-based statistics production is a new area which is rapidly gaining in significance now that the majority of statistics are based on data obtained from administrative registers. A sound theoretical basis is needed for measuring the accuracy of statistics based on administrative registers, but the options currently available are quite limited. Variance estimates or confidence intervals are not usually computed.

Statistics production in Finland relies largely on existing administrative registers and on linking data from these registers. Research on the methodology of register-based statistics production focuses specifically on register-based estimation and on questions of register quality and comparability. It is important to step up our research efforts here and particularly to work more closely with other statistical agencies in the Nordic countries and elsewhere. Important items of future research are the study of register characteristics and methods of estimating and adjusting register errors, and the methods of estimating and adjusting measurement errors.

A common concern for the development of survey methods and register-based methods is to have *closer methodological integration of sample-based and register-based statistics production*. The aim is to intensify the joint use of sample-based and register-based data sources in statistics production.

f) Statistical data disclosure methods. The importance of statistical data disclosure methods

to statistical agencies is explained by the strict data disclosure regulations that are in place. This area of research comprises research and development in the disclosure methods required for the collection, storage, transfer, analysis, release and publication of data.

Statistics Finland shall closely follow developments in this field and join forces with Eurostat and universities in a concerted research and development effort. An example is provided by statistical data disclosure methods for geo-referenced data needed in Geographical Information Systems (GIS) applications. Research in this area has been carried out successfully in co-operation with the University of Jyväskylä Department of Statistics.

g) Classification methods. Classifications and code systems are important tools of statistical harmonisation both in Finland and elsewhere. With the growing needs for harmonisation in the European Union, standardised classifications have emerged as a central object of the development of official statistics in recent years. The Community has issued directives concerning several of its statistical standards, and Member States are obliged to draw up their own national standards in compliance with EU regulations. Since many international classifications are harmonised with the EU standards, the further development of those standards also requires close co-operation with the UN Statistical Division. Statistics Finland is expected to make an active contribution to the work of incorporating the appropriate changes into these classifications. Among the most important EU standards are NACE (industry classification), CPA (product classification), ISCED (educational classification), ISCO-88 (COM) (occupational classification) as well as classifications of the new European System of National and Regional Accounts (ESA 95).

Eurostat is currently updating its industry and product classifications. The updated classifications will be implemented in the Member States in 2002. The Fifth Framework

Programme for Research and Development will include a project focusing on the usability of classifications, laying the foundations for the revision of classifications and for the development of future classifications.

Revised and updated national versions of the ESA-based classifications will be implemented. The revised national classification is compiled on the basis of the Classification of institutional sectors and the Classification of the functions of the government, COFOG.

A new classification is the Classification of Land Use, which is based on a classification system comprising land use, land cover and soil; it will focus on the use of land areas from the point of view of economic activity. A new statistical classification regarding employment zones, based on workforce commuting, will be implemented, together with a programme for defining these employment zones.

h) Information technology. R&D in meta-data and information architecture is a growing area of study at Statistics Finland's Information Technology Services. To make progress in this area universities in Finland will be contacted to look into the possibility of research co-operation.

The work that has been done so far in researching meta-data and information architecture is crystallised in Statistics Finland's production model, which is a vision of the structures that go into statistics production systems. The key idea is the integration of information systems. Modern, open systems create an environment which allows for the flexible integration of different kinds of systems. The production model provides a framework within which this integration can take place.

Other operations at Statistics Finland, including research and development, are also influenced by this production model. Just as the production model serves as a framework for the integration of the statistical system, so it can create a frame of reference for the evaluation and further development of research.

Electronic data collection and distribution is set to increase dramatically. Printouts will increasingly be in electronic format, gradually taking over from traditional hard copies on paper. The Internet will increase its importance as the main channel of information distribution.

i) Statistical quality work. The primary goal set out in Statistics Finland's quality policy is to put the agency among the world's leading statistical agencies and to achieve the points needed for the national quality award. This requires that the quality of all operations at Statistics Finland can be further improved, but also and importantly that the principles of quality management are extended to statistical systems and to personal quality.

The basic training on quality work provided by consultants from the US-based research institute Westat during 1996–99 has been very important for the agency. Over the next few years the emphasis will shift to implementing the methods of continuous quality improvement. *The Guidelines for Quality Improvement in Official Statistics*, a manual recently produced for the harmonisation and integration of various statistics production processes, will be subject to periodic updating. The key word here will be knowledge management, which refers to the documentation of the CBMs (Current Best Methods) and their distribution inside the agency regardless of unit boundaries.

3. Implementation of Research

The final chapter of this Document addresses questions related to staff resources and research implementation. The basic policy is to provide further and supplementary training to staff members with a view to strengthening their orientation to research and on the other hand to encourage research co-operation with universities, research institutes and other organisations both at home and abroad. An important precondition for a successful and cost-effective research effort is to create a good and comprehensive network of contacts with other research communities. Applications for research funding shall be directed increasingly to outside sources.

A basic premise in the allocation of research resources is the recognition that scientific research is a long-term effort; it is rarely possible to achieve immediate success in completely new areas of research. In each case it is important to find the right balance in terms of resource allocation between the short-term development needs and the long-term research interests so that the continuity of core competence areas of research can be guaranteed and so that research efforts can be stepped up and new projects launched where necessary.

Staff Commitment to Research

Strengthening the orientation to research. In order to make a meaningful contribution to scientific research, any statistical agency needs first and foremost to have a challenging set of research problems and a competent and committed research staff. According to Statistics Finland's budget and action plan for 2000–2002, the agency shall seek to improve its sensitivity and responsiveness to current research and statistical needs by raising its level of expertise

in key areas. This shall be achieved mainly through natural staff turnover.

The agency must have a sufficiently large and competent research staff. The key task of this group of experts is to identify and resolve *methodological and substance problems*. Recruitment of outside experts on a temporary basis can help to speed up the creation of the necessary critical mass.

It is also necessary to invest heavily in the activation of the agency's research potential. One relatively easy and inexpensive way of raising the agency's research profile is to encourage researchers to co-author reports and publications with outside experts. With Statistics Finland's experts involved in these kinds of joint publications, they will also be able to make available their expertise and knowledge of existing data sets from the very outset of the analysis. At the same time these projects help to give staff members a better knowledge and understanding of the subject concerned and the respective research methods.

Further training. Research projects for the completion of post-graduate degrees are an important part of learning and assimilating a strong research orientation. At the same time, the work which is done in these projects provides important additional qualifications for statistics production and research work. Therefore every effort must be made to encourage post-graduate studies as part of the agency's overall research effort.

Over half of Statistics Finland's workforce have an academic degree at the graduate level of higher education. Some 4% of the staff have completed their doctorate or a licentiate's degree. The high level of staff education provides a solid basis for further training. An important

way of encouraging staff to take up a post-graduate degree programme is to further strengthen within the agency a positive and supportive attitude towards research work. The agency shall make every possible effort to promote and support post-graduate studies. For instance, staff may be released for certain periods of time to prepare their research plans, or they may be assisted in applying for research grants from outside sources. Each year Statistics Finland invites applications for a quota of "researcher months", providing an opportunity for staff to work on their own post-graduate research projects on a paid leave of absence. Another, more lasting way to strengthen the agency's research orientation is to revise job descriptions so as to contain a stronger research element.

Supplementary training. The challenges faced by academic staff in their daily jobs increase their motivation to supplementary training, both in methodology and in their particular subject matter areas. Rotation between different types of jobs within the agency would help to increase the number of people who have the competence to prepare complex background research reports and to engage in commissioned studies, but who do not necessarily have a licentiate's degree or doctorate. Statistical or research assistants without academic degrees need to have a basic knowledge of statistics and the social sciences so that they can work independently in statistics production or take part in teamwork or information services.

Apart from providing post-graduate training courses for researchers, Statistics Finland also has co-operation with university centres for extension studies to offer professional development (PD) training with a substantial share of social theory and research methods.

The best possible use shall be made of the statistical training programmes available, particularly the EU Training of European Statistics programme (TES). Besides sending personnel to participate in this programme, the agency can propose courses for inclusion in the programme.

The agency has already contributed a course on survey methodology (under the heading "Variance Estimation and Discrete Data Analysis for Complex Surveys").

The agency will continue to invest in supplementary training open to everyone working in the field of official statistics, and to organise courses and seminars on different aspects of statistics and statistical methods, with lecturers including both Statistics Finland and outside experts. The role of the Statistical Library as a centre for research information shall be further strengthened.

Allocation of research resources and organising research. At Statistics Finland the most flexible solution for securing an adequate research input is to release people from their regular duties to undertake research projects on a fixed-term basis, giving them the opportunity to complete a thesis or some other project which they could not do if tied to their normal duties. This requires a centralised system of resource allocation within the agency, funding from the units as well as external funding.

Applications for research funding are increasingly directed to outside sources, both domestic and international (and particularly the European Union). Important outside sources of funding for research work aimed at the completion of post-graduate degrees include the Academy of Finland and various foundations. Assessments of the research plans proposed must pay greater attention to quality; funding can only be made available if the plan is good enough.

Increasing importance shall be attached to participation in international scientific conferences and workshops. People attending shall normally be required to contribute a paper. Where possible conference papers shall be upgraded into scientific articles for publication.

Every effort shall be made to increase the publication of research results through international scientific journals. A major concern in this regard is to improve reporting skills. Another forum which is available for the scientific con-

tributions of staff members is Statistics Finland's own Research Reports series.

The most important area of research and development for Statistics Finland is still that of statistical and other methods research. The *Statistical R&D Unit* works closely with the relevant statistical units and researchers to produce up-to-date and scientifically valid methodological solutions for purposes of statistics production and empirical research. This requires both applied and basic research, which is done mainly in co-operation with universities and research institutes and other partners. The unit is also charged with the responsibility to provide training and consultation services in order to raise the standards of methodological know-how in official statistics production. Where necessary the unit can also provide research facilities for agency staff working on temporary research projects as well as for outside researchers working at the agency for a fixed period of time and requiring the methodological expertise of the R&D Unit.

Co-operation with Universities and Research Institutes

Acquiring outside expertise. In projects where the agency needs to respond quickly to emerging new phenomena or current problems, Statistics Finland shall recruit outside experts to support the agency's own workforce.

Fellowship system. Statistics Finland has had encouraging experiences during the past few years of the fellowship system, a permanent arrangement for the use of outside expertise. Within this system top experts from Finland and abroad have been invited to work at the agency in a consultancy role for a number of months to help resolve specific methodological problems. One of these experts is Professor Carl-Erik Särndal from the University of Montreal, who has been actively involved in methodological research projects and who has provided supervi-

sion to post-graduate students. Each year 2-3 fellowship experts are invited.

Outside researchers and post-graduate students at Statistics Finland. Support for outside researchers and post-graduate students must be chiefly allocated to projects which make use of data sets compiled by the agency itself and which strengthen the professional competence of Statistics Finland staff. Outside researchers requiring access to sensitive data shall be given the opportunity to work at Statistics Finland to the extent that this is possible within the confines of the resources available. The needs and interests of supplementary training for Statistics Finland staff shall be taken into consideration in drawing up research contracts.

A good example of Statistics Finland's current activities to improve co-operation with outside researchers is a *research services facility* which aims at improving the use of data from business registers and business surveys for economic and related research purposes. The high level of competence in this area and networking with universities and research institutes open up new opportunities for research co-operation in business statistics. Research projects produce new ideas for improving statistics, enhance the quality of statistics and lead to a closer involvement with Statistics Finland on the part of researchers.

Networking procedures and meaning of networking. Networking helps to raise standards of scientific research (both empirical and methodological) at Statistics Finland. One way to establish contacts is to take part in the scientific debate in the field of study concerned. Staff shall be supported in every possible way in their efforts to create contacts with other experts in their field. Networking is also an invaluable asset in scientific research itself. Participation in research networks obviously requires sufficient qualifications and competence in the field concerned.

One example of networking is provided by the agreement of research co-operation signed between Statistics Finland and the University of Jyväskylä in 1996 and renewed for a five-year period in 1999. The aim of this contract is to promote and facilitate the utilisation of scientific research in survey sampling, to raise levels of staff competence, to make sure the agency will continue to have the necessary statistical expertise at its disposal, and to develop and introduce new, innovative methods of statistics production and distribution. One of the R&D projects under the umbrella of this agreement is the *Research Project for Social and Business Survey Methods*. Several staff from Statistics Finland are involved in this project in the capacity of post-graduate students. As a part of the agreement, Statistics Finland has contributed to the funding of a two-year Master's Program in Statistical Systems, organised by the Department of Statistics at the University of Jyväskylä. The program has also appeared to be useful as a recruiting channel for young statisticians in the agency.

International Research Co-operation and Consulting

Through its involvement in international research projects Statistics Finland is well placed to influence and make decisions on the focal areas of R&D work, particularly on the European arena. The agency's active involvement in international research co-operation and the work to prepare proposals for new projects both call for an increased input into R&D. International consulting services in the framework of the Phare, Tacis and bilateral programmes call for substantial inputs on the agency's part in providing the recipient countries with adequate and up-to-date methods and subject matter training and statistical know-how. These activities shall be closely integrated with the agency's R&D work.

International research co-operation. In its statistical and other R&D work Statistics Finland re-

lies increasingly on co-operation with universities in Finland and abroad. Internationally, the agency also works closely with other national statistical offices and with Eurostat. Productive research and development by the agency provides a solid foundation for a positive impact on the development work of the European Statistical System, which often takes place in Working Groups and Task Forces launched by Eurostat. Other important frameworks include the CIRET Network, IARIW (input-output working group) and certain so-called City Groups, such as the Voorburg Group, the Siena Group, the Canberra Group, the Paris Group and the London Group.

In order to be in a position to follow international developments in statistical methods and applications, Statistics Finland participates in the activities of the International Statistical Institute (ISI) and its sections, e.g. the International Association of Official Statistics, the International Association of Survey Statisticians and the Bernoulli Society. The agency's experts made an active scientific contribution to the 52nd Session of the ISI in Helsinki in 1999. The next ISI Sessions will take place in Seoul in 2001 and in Berlin in 2003.

EU research projects. It is important that Statistics Finland is actively involved in the Fifth Framework Programme for R&D (1998–2002), for instance by participating in joint projects and by submitting proposals for new projects. Joint projects in which Statistics Finland is currently involved include AutImp (Automatic imputation methods and software for business surveys and population censuses), Euredit (Development and evaluation of new methods for editing and imputation), Clamour (Improving the quality of existing and future classification systems), Missio (multi-agent integration and shared statistical information over the Internet), Meter (Metadata and telematics for enterprise reporting) and Chintex (Change from input harmonisation to ex-post harmonisation in three national samples of the ECHP). There has been very useful co-operation with other statistical agen-

cies, and in many of these projects the agency also co-operates with different universities. Statistics Finland has also benefited from those smaller but nonetheless significant research grants that can be obtained through country-specific research contracts with Eurostat.

For better co-ordination of international R&D activities, there is a need to further develop participation procedures in R&D projects of the Fifth Framework Programme. Important criteria for participation in each special case include compatibility with the agency's overall research policies and expected value added for the agency's statistics production with respect to quality, comparability and cost effectiveness.

Statistics Finland's Research Services

Statistics Finland's research services comprise the various forms of expert assistance made available to researchers and staff doing background research, mainly in the processing of existing data sets or in the collection of primary data. Methodological expertise is available for researchers in such areas as sampling, research designs, methods of data collection, statistical estimation and analysis, and statistical software.

The backbone of statistics production is formed by administrative data, which are well-suited for research purposes in that they are unique and comprehensive. They are also in machine-readable format and inexpensive to use. The linking of data from different registers

and different years provides a new and interesting angle for researchers.

Statistics Finland's expertise in the use of sample-based survey materials is particularly strong in the areas of living conditions and social statistics as well as the related statistical methodology. Through its experience in the planning of research, its experienced network of interviewers and extensive national samples, Statistics Finland continues to produce useful survey data sets for researchers. Statistics Finland's expertise in statistical methodology is often valuable in methodologically careful studies based on these materials.

Statistics Finland's public image as a competent, respected statistical agency which provides a high-quality research service must also be reflected in its fee-based operations. Closer links must be established between the agency's scientific expertise and its fee-based contract research. Statistics Finland's main asset in the competition with commercial research institutes is the quality of its operation. To provide value for money, the agency needs to have in place a full range of high-quality research services, including extensive survey and register data sets, expertise in sampling methods, innovative use of computer-aided interviewing techniques (CAPI and CATI), a competent interviewing network, careful testing of interview questions, professional use of statistical methods of analysis and effective use of its expertise in the definition of research problems, in the planning of research and in the search for appropriate research designs.

APPENDIX I.

Defining the Scope of Research

The definition of what research actually comprises in a statistical agency is no simple and straightforward matter. For the purposes of this Document, research (and related development work) is defined as the systematic application of theories, concepts, methods and principles of scientific research in an attempt to increase existing knowledge and to apply that knowledge in the development of new practical applications. A distinction can be made between four levels of research:

Basic research produces new information, but it is not primarily aimed at discovering new practical applications. Basic research produces and tests new concepts, hypotheses and theories.

Applied research produces new information and aims on this basis to discover new practical applications. Ultimately the goal is to find better methods for resolving existing problems.

Development work is based on both research and practical experiences, which are used for the introduction of new products, production processes, systems and methods or for the improvement of existing ones.

Finally, *implementation* of new or improved methods and processes to statistics production comes at the lowest, most practical, level.

In practice, of course, there can be and often is overlap between these levels. For instance, applied research and development work may also involve basic research.

Scientific research is characterised by the *principle of knowledge accumulation*. For this to be possible, research is expected to follow the *principle of transparency*, i.e. all research results shall be published in appropriate fora (scientific and other similar journals, international scientific conferences, etc.). The principle of transparency, for its part, makes possible another important aspect of scientific research, i.e. the *availability of research results for evaluation by the international scientific community*.

There are certain areas of statistics production that are not counted as research proper even though they often provide crucial supportive material for research purposes. One such area is represented by background investigations carried out for planning and decision-making purposes. Typically, these investigations will be conducted for a specific end-purpose, aiming to describe the phenomenon in hand. The results will have limited applicability and be used by a limited number of people. Another example of work which is not counted as research is data collection for general purposes (i.e. not for specific research purposes), such as document archiving, current opinion polls, etc. Similarly, work that is done in software applications for data processing is not normally counted as research unless the application is related to the development of new, general-purpose software or to upgrading old programmes.

APPENDIX 2.

Finland and Statistics Finland in brief

Finland and statistics research in Finland in a nutshell

Finland covers a total area of 338,000 square kilometres. Some 70% of this consists of forests and 10% of water in the form of about 188,000 lakes and 650 rivers. There are over two million saunas for a population of 5.1 million inhabitants. Almost all of the 400,000 summer cottages in the country and most detached houses have a sauna, and over one million flats are equipped with one. When Finnish people unwind in sauna on Saturday, 93% speak Finnish, 6% Swedish, the second official language, and 0.03% speak Sami.

Finland has been a member of the UN since 1955, of the OECD since 1969 and of the European Union from the beginning of 1995. Parliament consists of 200 members elected for a four-year term. The President of the Republic is elected by direct, popular vote for a six-year term, and the post is currently held for the first time by a woman, Ms. Tarja Halonen (since March 2000). Finland was the first country in the world to give women the right both to vote and to stand as candidates in all elections (1906). At present there are 73 women among the 200 Members of Parliament, and six of the 18 Cabinet Ministers are women (August 2000). Women's labour force rate is 67%.

Access to a mobile phone and to an Internet connection are among the highest in the world. For the education and enjoyment of Finnish people and their guests there are nearly 1,000 public libraries, 37 large research libraries, 31 orchestras, 57 professional theatres, 284 museums and 56 daily newspapers in the country.

There are 13 statistics departments in the country's 17 universities. The departments of statistics operate either in faculties of social sciences or in faculties of mathematics and computer science. Many other faculties also offer basic education programmes in statistics.

An example of statistics education is provided by the Master's Programme in Statistical Systems at the University of Jyväskylä Department of Statistics. The main focus in the programme is on the collection, analysis, management and dissemination of large data sets. From a statistical science viewpoint, the programme concentrates on survey methodology, including sampling theory and the analysis of complex surveys.

Key areas of statistics research at universities include Bayesian Statistics, Biostatistics, Demography, Econometrics, Epidemiology, Generalized Linear Models, Life-history Analysis, Linear Models, Mathematical Statistics, Multivariate Analysis, Non-parametric Statistics, Sampling, Statistical Computing, Spatial Processes, Statistical Methods for Quality Improvement, Statistics of Agricultural and Forest Sciences, Stochastic Processes, Survey Methodology, and Time Series Analysis.

Other research organisations and their main areas of statistics research (in parentheses) are the Agricultural Research Institute (Experimental Design), the City of Helsinki Information Management Centre (Urban Statistics), the Forestry Research Institute (Statistical Methods of Forest Mensuration), the National Health Institute (Biostatistics; Epidemiology), the Research Institute of the Finnish Economy (Statistical research in econometrics), and Statistics Finland (Survey Sampling; Survey Analysis).

Founded in 1920, the Finnish Statistical Society, is a non-profit making learned society

whose aim is to promote the development of statistical theory and its applications and to bring together statisticians and other professionals in different fields of statistics and research. Members (about 500) represent statisticians working at statistics departments in Finnish universities as well as in statistical offices and research institutes.

Official Statistics in Finland

Official statistics are compiled by some 30 authorities. In addition to Statistics Finland, these include the Agriculture and Forestry Administration, the Association of Finnish Local Authorities, the City of Helsinki Information Management Centre, Customs Administration, the National Research and Development Centre for Welfare and Health, the Social Insurance Institution, and municipalities.

Statistics Finland accounts for three-quarters of official statistics. It also supervises and co-ordinates the statistical work of other authorities. The sector as a whole is governed by the Statistics Act, which lays down the general principles of collecting data and compiling statistics, the duty of disclosure, and confidentiality. Statistical information is extensively disseminated in the media: each year the print media publish a total of 3.000 news reports or articles based on material released by Statistics Finland.

Membership of the European Union has greatly increased the amount of work done within international organisations. The key objectives are to improve the international comparability of statistics and to promote the use of international statistics. There are particularly close contacts with Eurostat, the EU's statistical agency. International consultation is increasingly important, particularly in Finland's neighbouring regions that are currently in the process of transforming into market economies.

The first independent Finnish statistical office was founded in 1865, when Finland was still an autonomous grand duchy of Russia. The first statistical yearbook was published in 1879. After 1917, when Finland gained independence, new

statistics were established on such areas as social problems and economic trends. National accounting was introduced in 1947, immediately after the UN recommendation was passed.

Statistics Finland has a staff of over one thousand, including 170 part-time interviewers in different parts of the country. Just over 80% of the activities are financed from the state budget, the rest is covered mainly from services subject to charge.

The agency is divided into nine units, three of which are mainly concerned with internal and external services and six are statistical units proper:

Population Statistics compiles statistics on population, education, justice and crime, elections and also on housing and regional employment.

Social Statistics, responsible for the agency's sample survey and interviewing activities, compiles data on employment, incomes and wealth, consumption and other aspects of living conditions. It also produces statistics on time use, culture and leisure.

Prices and Wages Statistics is responsible for data on prices and wages, and statistics on labour disputes.

Business Statistics comprise two units, **Business Trends** and **Business Structures**, which collect data from businesses and work up the material into statistics describing various industries.

Economic Statistics combines data from several basic statistics to form the system of National Accounts, and it also releases various economic indicators on total production and the financial markets.

Statistics Finland obtains the majority of its data from various registers but also directly from enterprises, households or individuals. The use of administrative records is on the increase, which also reduces the response burden. The 170 interviewers employed by the statistical office use laptops and up-to-date automatic data transfer methods in the collection of survey data by means of telephone or face-to-face inter-

views. The CATI Centre is a recent addition to Statistics Finland's tools for survey data collection. Survey data sets collected by Statistics Finland have been made available to numerous outside researchers, some of whom have worked in office space provided at the agency.

The **Statistical R&D Unit** employs about 20 specialists in different areas of statistical and methodological expertise. In addition to this centralised unit, a number of employees specialising in statistical methodology work in the sta-

tistical production units, thus bringing the total statistical methods staff up to about 40 persons. In addition to the Director of Research, other experts from Finland or abroad have been invited to work at the agency under short-term fellowship arrangements.

The **Scientific Advisory Board** supervises research activities and helps to draw main lines of future research work. Several Finnish universities and research institutes are represented on the Board (see Appendix 3).

APPENDIX 3.

Statistics Finland's Scientific Advisory Board

Statistics Finland has appointed for 2000–2002 a Scientific Advisory Board representing specialists from various scientific disciplines and research areas as well as Statistics Finland's management and research staff.

The main tasks of the Scientific Advisory Board are:

- to promote co-operation of the agency with universities and research institutes.
- to monitor research in the social sciences, economics and statistics.
- to evaluate the implementation of the document *Statistics Finland: Main Lines of Research and Development in 2000–2003*, to process research projects along the lines set forth in this document and to make plans for further and supplementary training.
- to co-ordinate preparation of the next document for the main lines of research and development.
- to function as an Editorial Board for the Research Reports Series.

Members of the Scientific Advisory Board:

Chairman: *Timo Relander*, Director General of Statistics Finland

Invited Members:

Director General *Reino Hjerppe*, Government Institute for Economic Research (VATT)

Professor *Pekka Ilmakunnas*, Turku School of Economics

Professor *Hannu Niemi*, University of Helsinki

Professor *Leif Nordberg*, Åbo Akademi University

Professor *Jussi Simpura*, National Research and Development Centre for Welfare and Health

Professor *Carl-Erik Särndal*, University of Montreal

Professor *Tapani Valkonen*, University of Helsinki

Professor *Yrjö Vartia*, University of Helsinki
Research Director *Pekka Ylä-Anttila*, The Research Institute of the Finnish Economy (Etlatieto Oy)

Members of Statistics Finland:

Senior Researcher *Kari Djerf* (Statistical R&D Unit)

Director *Riitta Harala* (Population Statistics)

Director *Kaija Hovi* (Business Structures)

Senior Researcher *Anna-Maija Lehto* (Social Statistics)

Director *Risto Lehtonen* (Social Statistics)

Secretary: Senior Researcher *Timo Byckling* (Statistical R&D Unit)

Signatures:

Helsinki, March 2000

Director General

Timo Relander

Director

Kari Suokko

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REVIEWS

Statistics Finland: Main Lines of Research and Development in 2000 - 2003

Statistics Finland has a strong research orientation and it actively promotes social, economic and methods studies and the publication of research results. This report outlines the main lines of research and development at Statistics Finland during 2000-2003. Separate treatment is given to the focal areas of interest in social science and economic research, on the one hand, and statistical and other methods-related research, on the other.

Research will receive continued support in those areas that are most crucial to the needs of high-quality, up-to-date and relevant statistics production. In order to further these objectives the agency will also continue to work closely with both Finnish and foreign universities and research institutes.

The principles and practical measures outlined in the programme aim at maintaining a productive and active research community in the agency. Moreover, the programme includes an up-to-date account of the various facets of the agency's research activities. The preparation of the document has been co-ordinated by Statistics Finland's Scientific Advisory Board.

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