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Statistics for the Information Society - The Way Forward

Document by Olof Gärdin

Statistics for the Information Society
The Way Forward

The structure of this document

After the introduction some ideas from three different sources are presented to give a general input to our discussions of the Statistics for the Information Society. The first is the Eurostat document "Statistics for the Information Society. Perspectives for the future". The second is a few ideas or comments that was taken up at the DGINS conference Information Society and Statistics in Helsinki May 1997 and the third is a study done by Maastricht Economic Research Institute on Innovation and Technology (MERIT) commissioned by Eurostat. A first outline of the scope and content of the statistics for the Information Society is then presented and the document concludes with the Eurostat strategy for work and a preliminary Action Programme.

Introduction

Information Society at the top of the EU policy agenda

EU policies and actions to promote the emerging Information Society is at the top of the EU policy agenda. Article 129b in the Maastricht Treaty stipulates that the European Community shall contribute to the establishment and development of trans-European telecommunications networks. The White Paper "Growth, Competitiveness, Employment. The Challenges and Ways Forward into the 21st Century" focus on the crucial role Europe's way into the Information Society has for Europe's future. The report "Europe and the Global Information Society. Recommendations to the European Council" (the Bangemann Report) was prepared by a high level group of experts. It was discussed at the Korfu summit and made the foundation for the "Action Plan. Europe's Way into the Information Society", that was first decided in 1994 and subsequently is being implemented.

The Commission has established an Information Society Activity Centre (ISAC). Within ISAC there has been established an Information Society Project Office (ISPO), as a centre for information on all projects and other activities related to the promotion of the Information Society. ISPO has a home page on the Internet for dissemination of information concerning Information Society activities.

The G-7 Ministerial Conference on the Information Society in Brussels in February 1995 gave further focus on and impetus to policies and actions to promote the transfer into the Information Society.

OECD has in co-operation with DG XIII completed a series of Workshops on the Economics of the Information Society. The motivation for these Workshops was the conclusion that we do not understand the Economics of the Information Society because of lack of adequate theories and quantitative information, statistics.

Emerging Statistics for the Information Society

An important part of Eurostat/D2 activities on services statistics has a more or less direct relation to the information society, for example statistics on audio-visual services (AUVIS), communication and information services (COINS) and business services. For that reason awareness of the needs, importance and problems concerning statistics for the information society was early risen, as well as some specific actions were initiated.
A first overview and discussion of the issues to be approached was given in the document: "Expected changes in Services Statistics: a look into the "Crystal Ball"; document presented to the tenth meeting of the Voorburg Group on Services Statistics 1995.
At the request of DG XIII Eurostat has contributed to the OECD Workshops mentioned above with a document (the first version of "Statistics for the Information Society. Perspectives for the Future) and by acting as discussant.
In the meetings of the Information and Communications Working Group in March 1996 and the Task Force for a pilot survey on telecommunications services in June 1996 initial discussions on statistics for the information society were held. These meetings were the prelude to the first meeting in December 1996 of the Working Group for Statistics for the Information Society. In some Member States, especially the Nordic Countries, initiatives had already been taken concerning statistics for the information society.
The co-operative establishment of a GUS (a group of users) by Eurostat and ISPO (see above) will be essential to guide the future works in the field of the Information Society.
The document "Statistics for the Information Society. Perspectives for the Future" addresses different aspects and issues concerning statistics for the information society. It was presented to the eleventh meeting of the Voorburg Group on Services Statistics 1996, the Co-ordinating Committee on Services Statistics in November 1996 and to the Working group on Statistics for the Information Society in December 1996.
In order to give these activities a legal and administrative platform the ***Statistical Framework Programme for the period 1998-2002*** includes Statistics for the Information Society in a special theme Communications. This theme comprises also postal and telecommunication services and audio-visual services. Statistics for the Information Society is a horizontal approach and the aspect of the user´s of statistics and is based largely on exploitation of sector oriented statistics. Three core sectors for statistics for the Information Society are telecommunications services, audio-visual services and business services, specially computer related services.

The 83 rd DGINS Conference

The 83rd DGINS conference in Helsinki on 29-30 May 1997 focused on the subject "Information Society and Statistics". One theme was "Problems of statistical measurement in the Information Society", and the other the "Effects of the information society on the NSI's". The proceedings of this conference will be one important starting point for the Eurostat development of statistics for the Information Society.
In his opening speech to the conference Mr. Franchet, the Director General of Eurostat, said inter alia:
"The world is changing rapidly and profoundly and we statisticians need not only to follow the changes but also to anticipate them. The Information Society is a concept that is more and more brought into the focus of interest.
Our statistics are increasingly used for political decisions, for the day-to-day decisions of governments and economic operators and by researchers engaged in describing and analysing different aspects of the economy and the society. It is vital to ensure that our data evolve, continue to measure what they need to measure, remain relevant and are widely known.
Our task as statisticians is to give more precise meaning to Statistics for the Information Society - to precise the main issues to be covered, the scope and content of the statistics and the means and methods for measuring and mapping the Information Society.
It is crucial that we come to a common and generally accepted agreement on the scope and content of statistics for the Information Society".

Why Statistics for the Information Society?
Discussions and policies concerning the developing Information and communication Technologies (ICT) and their impact on the economy and the society at large have successively changed direction since the 70s. First it was mainly the ICT industries that was in the center for the discussion: their growth, competitiveness and economic importance. Then the focus shifted towards the use of ICTs and the impact on competitiveness and growth of enterprises and industries. And now the emphasis has moved again towards the impact on employment and on social, cultural and democracy aspects. The Green Paper "Living and Working in the Information Society. People first" is a recent example of this.
The ICTs are generic technologies that can be used in all sorts of goods and applications. It is the creativity and competence of people that set the limits. The diffusion of ICTs has an important impact on the generation of knowledge, on the way work is organised and how goods and services are traded. Through the use of ICTs, the codification process has been accelerated whereas the spread of codified knowledge itself has become easier due to the presence of new ICTs.

The Information Society implies the ability to access immense quantities of information and entertainment on demand, to interact with and manipulate large quantities of data, to transact remotely and to communicate while on the move.
We talk not only of the Information Society but also of the Knowledge based Society or Economy. Sixty percent or more of the GDP are generated by the services sectors, which motivates the term Services Society. We talk also about intangibles and the intangible economy. The phenomena behind these different terms are closely interlinked, so there are no clear-cut or easily defined borders between the different "societies"; which term one chooses to use is to a great extent a matter of emphasis and focus of interest.
However, we can see that the fact that in the Information Society borders - between nations as well as enterprises - lose their importance and globalisation is a reality. This underlines the necessity of internationally comparable and coherent statistics to help us improve our understanding of the development.

The mismeasurement of the Economy
Because of the technological, commercial, institutional and legal developments, it is likely that our statistics measure less and less accurately that they are supposed to measure.
In The Knowledge Based Information Economy[2] it is said that

"Production technology is increasingly moving economic activities across the statistical categories we have become accustomed to. The economist's representation of a nation - a statistical system interacting with the statistical systems of other nations, each being autonomously controlled by a political authority - is being gradually diffused through the international integration of markets and the increasing presence of multinational corporation. Thus, we are measuring less and less well what is becoming economically more and more important. We lack the measurement system needed to capture an advanced market economy in operation, because we lack the adequate guiding theory".

[2] G. Eliasson, S. Fölster, T. Lindberg, T. Pousette, E. Taymaz: The Knowledge Based Information Economy. The Industrial Institute for Economic and Social Research. Stockholm 1990.

In the "Crystal Ball"[3] it is pointed out that

"Certainly the tools at our disposal today, such as activity and product nomenclatures or registers and statistical units, are not adequate for investigating services phenomena because they have been forged to serve national purposes in a manufacture based economy".

"The globalisation of the economy and the new organisation of business at world level, the European single market, NAFTA, GATS are transforming the structures of enterprises and relation between them. Externalisation of services production will be less and less limited by space. Production is not anymore a national concept".

Against this background, it is important to put much effort towards development of the statistical frame of reference, i.e. the concepts, definitions, variables, data collection and survey systems etc., necessary to study and understand the information society. This should be done with an international perspective so that the statistics will be internationally or globally comparable.

Statistics for the Information Society. Perspectives for the future

The development of the ICTs and their introduction in the economy and society has given rise to some main trends that will have a great impact on the Information Society and Economy. They imply some of the needs for development of the statistics.

The **relocalisation** of activities made possible by the telecommunications networks. Networking has two directions. It can mean a decentralisation of activities but also a centralisation. The **regional aspect and the spatial dimension** is important

In the information and knowledge based society **new knowledge and competence** will be required and old will become obsolete. The training, education, competence and professions of the **human resources** will be crucial for the development.

Mobile communications can be foreseen to have profound implications for how people interact and arrange their lives at work or at leisure.

The increased **flexibility** made possible through the (mobile) communications networks will probably make the distinction between working time and free time less sharp and more flexible. Also the place where to work or produce will be more variable.

[3] Photis Nanopoulos, Marco Lancetti: Expected changes in Services Statistics: a look into the "Crystal Ball"; document presented to the tenth meeting of the Voorburg Group on Service Statistics; Voorburg 1995.

New ways of organising enterprises and production, like outsourcing, systems deliveries, "virtual" enterprises etc., will emerge and become ordinary. It will be more and more common that small and medium sized enterprises (SME) are linked together in networks.

Four statistical domains

Following the discussion and policies related to the emerging Information Society it is possible to identify four main statistical domains of relevance when trying to transform the volatility of the Networks and the Information Society into manageable statistical terms. They are:

The Telecommunication Networks or Infrastructure as such. These give the possibilities and sets the limits for the potential of the Telecommunications Services in the economy. The availability and accessibility of Telecommunication Infrastructure is important from many policy relevant aspects: social, regional, cultural etc. The statistics on the infrastructure have by tradition been fairly good concerning the public networks. With the increasing development of leased lines and private circuits an increasing part of the network is not covered by statistics.

The ICT and Information Industry itself, i.e. the producers or suppliers of Information and Communication Goods and Services. This industry's importance in the overall economy, competitiveness, growth, structure and employment. Here it is necessary to define these in terms of industrial and commodity classifications.

The use of the ICT Services and Information. It is the use in enterprises as well as by people that is of interest. The diffusion, extent, purpose of the use. The impact on the organisation and behaviour of enterprises, productivity and competitiveness in all economic sectors. The ICT Industry is itself one of the most intensive users. The use by persons both at work and leisure and the economic, social and cultural impact on everyday life.

The creation of new business opportunities, concepts and ideas - of new processes, goods and services through ICT and Information, i.e. the innovation and diffusion process in the society and economy. This also contributes to the blurring of industry sectors.

Development of statistics for the Information Society

From what is said above, some general directions in which the statistics for the Information Society should be developed can be deduced. They are:

Enterprise statistics

- develop a taxonomy of enterprises and their different ways to interact
- improve the statistics coverage of small enterprises
- develop statistical concepts and categories for the enterprises internal economy and accounts that are reconcilable and compatible with the statistical concepts and categories that are used for the economy on the market. Bring statistical and accounting practices closer together.
- develop the definitions of the results from information activities - the information and services products.

Emphasis on the human resources

- employment
- training, education, skills, competence levels
- occupations, professions

Geographic localisation, concentration patterns

- enterprises: clustering of different economic activities; regional, national, global.
- persons: clustering of professions, competence etc.; regional, national, global.

Communication patterns

- telecommunications role in the total communications system and the interaction with other forms of persons, goods or messages communication.

Emphasis on use and demand

- enterprises: extent of use, costs, investments, different services and applications
- persons: extent of use, spending, different services and applications

In general, the statistics are rather supply oriented. In the statistics for the information society there should be a better balance between supply and use.

DGINS Conference "Information Society and Statistics"

The purpose of this section is to give a glimpse in a very condensed form of some of the ideas and comments presented in the 83rd DGINS conference. This conference covered two themes: "Problems of statistical measurement in the information society" and "The effects of the information society on NSIs". The rhapsody here is confined to the first of these themes.

The time available has not allowed giving justice to the rich material presented. The proceedings of the conference will however soon be published and thus give the opportunity for everyone to take part of the complete material.

One introductory remark in the conference was that we are dealing here with a combination of problems, some of which are entirely new while others are either a reappearance in different guises of problems that have been known for a long time or a revival of topics that have long been neglected.

How to define the Information Society?

It was noted that various possible definitions could be made of the information society. To give an example of one possible definition the Australian Bureau of Statistics 1996 is cited as making a useful indication of the concept: "An information society could therefore be described in terms of its production and use of digital products which would include the digitising of existing information".

The information infrastructure, defined as fixed and wireless communication and equipment which make it possible to store, process, transform and transport information, is mentioned as the foundation of the information society.

A summarising comment was that, purely intuitively, we understand the term Information Society to refer to a new organisation of society, new compared with "the industrial society". This also suggests that statistics on the information society necessarily include all kinds of statistics: economic, business, social, cultural etc. The information society - and consequently the statistics intended to shed light on that society - is thus "horizontal" in character.

What characterises the Information Society?

Among the comments made concerning the characterising features of the Information Society were:

The rapid development of new products and services. Sectoral boundaries and the availability of products and services are continually changing and this reduces the usefulness of long term time series, fixed weight indices, rigid activity and product classifications.

Globalisation is being driven by plunging communication costs. Time and space are being compressed and this is resulting in increasing interaction and interdependency at a global level.
New ways of organising enterprises and production. IT makes the process of work a mobile process and breaks the physical links between employees and their place of work.

The scope and content of statistics for the Information Society

A great number of observations can be sorted under this heading. Among them were:
Statistics on *infrastructure* will be crucial for an understanding of the developments of the information society and for comparisons both regionally and internationally.
Statistics on different aspects of the *supply* of information goods and services. The goods and services of the information society will be produced not only within the information industries, but also as a secondary market activity in other industries and as in-house non marketed production. These activities should also be described statistically.
Foreign trade statistics will meet new challenges as trade in services, international trade based on Internet etc. increases. The increased globalisation makes it important to find ways to measure the new patterns of trade.
The extent of *use of ICT at work and leisure*, use of equipment and access to infrastructure are mentioned. It is noted that the economic variables should be supplemented by some physical measures of the availability and use of IT in the organisation.
The *use of time* is noted as important in this context. Current surveys of interest concerning private use are time use surveys, household budget surveys and surveys of living conditions.
Human resources is a concept that comes more and more into focus. This means that it is no longer enough to provide quantitative information on the workforce, i.e. the number of persons employed, full-time and part-time employees or the number of hours worked. The qualifications of the workforce will be crucial for our understanding of developments in the business world and the competitiveness of enterprises
The need for statistics on the *Internet* - trade, service providers, users - is pointed out.
Industrial classification.
The Information Industry needs to be classified according to the industrial classification. The challenge has been taken up by several actors and there are common elements in all proposals. The North American Industrial Classification System (NAICS) has defined an information sector. In Denmark work has been done on delimitation of so called resource areas - Communication is one - and an IT area. Eurostat has suggested a grouping according to different functions of different industries in the Information Society.
National accounts.
Much attention is given to the productivity paradox, productivity measurement, price indices and output measurement. More detailed input-output tables and the development of more disaggregated input-output analysis are advocated.
Intangibles.
The concern people feel about the impact of information technology is expressed in terms of increasing intangibility of the economy. Much of the confusion which surrounds the issues it raised is generated by the illusion that there is a set of distinct entities called intangibles. It is much simpler to look at intangibility as an aspect of a range of things More of the products people use are intangible, and where products are tangible more of their qualities are intangible, more of the “equipment” and “raw materials” used are

intangible. As a result, the area in which several dimensions of intangibility overlap has increased

Satellite accounts

Satellite accounts are in several contributions advocated as the context in which to present new industry and product classifications. They can also be used to develop indicators of welfare. The ability to combine monetary and non-monetary statistics creates the possibility of linking outputs to outcomes and so to welfare.

Outcome versus output.

It is pointed out that **s**ection 1 of Chapter 16 of the SNA 93 explains the difference between outcomes and outputs: The output of the health services needs to be clearly distinguished from the health of the community... Similarly the output of the education service is quite different from the level of knowledge or skills possessed by members of the community. Traditional national accounts have dealt with links between outputs and inputs. Any attempt to measure welfare must however deal with outcomes rather than outputs.

General priorities

The general priorities concern improvement of the general statistical system. This includes the development of a coherent statistical system which can be applied on a comparable basis by all countries. A well-defined, methodological work will be needed to identify and establish the indicators to be used to provide information on developments in the information society. It is also necessary to have an ongoing monitoring apparatus ready, in view of the speed with which changes are taking place in the organisation of the information society.

International co-operation

International co-operation will be needed to meet the obvious demands which the information society makes on national statistical offices and the future production of statistics.

MERIT Study

Eurostat contracted Maastricht Economic Research Institute on Innovation and Technology (MERIT) to do an explorative study of the consequences of the introduction and us of ICTs in our economies and how this can be captured by statistics. As the implications of the introduction of ICTs cover a very broad field of subjects, the study was limited to some specific items with significant implications for statistics. The first deals with the measurement of economic activity within current statistics and statistical concepts, i.e. output, prices etc. A key point is the mismeasurement of output and prices. A brief investigation of the impact of outsourcing on current statistics is made.

The second part deals with ICTs' role on the way enterprises are organised and how firms (or organisations) communicate with each other and with consumers. The central element here is the Internet and Internet related technologies. This new way of work is not captured within the current statistics whereas it is highly important for policy recommendations. For statisticians this implies a need for new concepts and methods and it will be a challenge to implement them in a short time.

The study recommends that a number of studies should be launched. Concerning the first part, these suggested studies are related to the delay with which new products and services enter the commodity basket; the role of price discrimination and methods to capture the quality of services. It is further recommended that diffusion of sectoral activities - which implies that the sectoral specific dimension of the statistics will lose in meaning - should be studied. And finally are further investigation of measuring the size of out-sourcing based on Input-Output tables recommended.

In the second part studies are recommended concerning the commercial use of the Internet from the consumer point of view; the use of ICTs and the implications for firms and the way they organise production; new methods for tracing international trade in "intangibles" and on how to capture the activities of the networks and the brokers.

In addition to the above mentioned studies the report recommends the study of R&D spillovers and their impact on the quality of investment goods. It is also noted that although the current literature on economic growth recognises the importance of human capital for economic growth, current statistics are not sufficient to give a clear indication of the size of human capital, nor its embodiment in products and services. Studies should be launched on how to make better use of existing data and developing "alternative" methodologies for interpreting the role of knowledge workers.

A summary of the study report is given in Annex I.

The scope and content of statistics for the Information Society

The DGINS conference noted that there is no clear definition of the Information Society. It seems also reasonable to suppose that the term "Information Society" cannot - at least not now - be precisely defined. It has not yet been achieved - one can think for example on "The Rolling Action Plan for Europe's Way into the Information Society" and the report "On the Road to the Finnish Information Society" - and there is considerable debate about the services and technologies that will create it.

However, there seems to be a general consensus on important elements and characteristics of the Information Society, so this lack of a definition should not hamper the development of the Statistics for the Information Society too much.

After all, one might say that the statistics do not attempt to measure the Information Society but different phenomena considered to be relevant in the context of the emerging Information Society.
Taking the wide spectrum of ideas, opinions and suggestions concerning statistics for the Information Society in account, the graph below is intended to be a general summary of the possible scope and content of statistics for the Information Society. The statistics for the Information Society is considered to be the part above the box marked “Information”.
One somewhat disturbing observation is that in the discussions of the Information Society and the statistics needed to describe and understand it, there is very little presence of “information” as such.

The possible scope and content of Information Society Statistics

Human Capital

- Statistics on Education, Training, Competence, Skills

Telecommunication Networks - Information infrastructure

* Infrastructure statistics

Producers	**Services**	**Users of ICT goods & services**
- Telecommunication services	***-Telecommunication***	***- Enterprises/Administr.***
- Network Operators	*- Transmission Services*	***- Persons***
- Services Providers	*- Network Value Added Services*	* Statistics on demand and usage
- Information/Content services	***-Information***	- Enterprises: costs, investments, applications.
- ICT Goods	*-Content/Subject matter*	NACE Rev.1; Geographic dim. etc.
* Structural Indicators	* Volume statistics	- Persons: spending, time, applications.
* Enterprise economic statistics	* Quality statistics	Gender, professions, social dim. etc.
	* Price information	

Trade

** Telecommunications services*
** Information services*
** ICT Goods and services*
- Statistics on distributive trade, exports, imports, BoP

Information

This is basically what it is all about, but we do not measure the information (at least in the meaning of sense) but the bearers of information. Does this mean that something very important is escaping us?

Development factors

- R&D, Innovations, Technology transfer, Diffusion.
- Attitudes
- Legal and institutional environment

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GDP; EMPLOYMENT; COMPETITIVENESS; ECONOMIC GROWTH.
ORGANISATIONAL, SOCIAL, CULTURAL , ENVIRONMENTAL IMPACT

Strategies for the development of statistics for the Information Society

There is no doubt that to-day there is a fundamental shortage of data and statistics enabling us to fully understand and analyse the emerging Information Society and the Networked Economy. The normal situation in Member States is that there is a shortage of good statistics on services.

With reference to the conceptual problems involved in the development of Statistics for the Information Society due to rapid technological and commercial changes and the lack of adequate economic theories, it is obvious that it will take time and effort to arrive at a statistical system, which makes adequate data and statistics for the information society available. The new technologies and the Information Society are fast developing and changing and the statistics are needed now.

Our resources however set a limit to what is possible for us to achieve. We have to be careful when deciding what the most urgent questions are. Our priorities has to be clearly defined. Two "pillars" for the data collection should be the already existing statistics on Communication/Information Services and on Audio-visual Services.

The strategy for the development of Statistics for the Information Society should be:

- to build on existing statistics and statistical systems; to adapt and develop them and to build separate satellite accounts to the ESA.
- to build on work done, under progress or planned in Member States, Eurostat and other concerned parties. In order to maximise synergies and to make the best use of our scarce resources the very close co-operation with other International Organisations, in particular the OECD, is obligatory.
- an important part of Eurostat/D2s activities should be to act as a "clearing house" for the exchange of information and experiences among the concerned parties.
- a step-by step approach with successive and regular assessments and revisions of the activities and projects.

It is also clear that there exist to-day a lot of relevant data, from unofficial or private sources. These data are more or less well defined and more or less comparable over time and between countries. It is often neither clear what they cover nor how reliable they are.

But they exist and are used by administrations and operators on the markets. They should also be evaluated and used in the process of developing and publishing adequate statistics for the Information Society. The possibilities of integration of official and un-official sources and the problems, that might be related to such an integration, should be looked into.

Action Programme

The preliminary Action Programme for Statistics for the Information Society consists of the following eight elements:

1 ***increase the awareness*** of Ministers, National Statistical Institutes, Regulatory Authorities and other concerned bodies in Member States on the need for statistical information and difficulties to obtain it;

The 83rd DGINS conference in Helsinki on Information Society and Statistics was a major event in this respect.

It is suggested that a Conference addressing governments and national administrations, the Commission, economic operators, research, professional organisations, international organisations, official and private producers of statistics. The topics to be dealt with have to be defined. Examples could be the role and availability of statistics in formulating managing, monitoring and assessing Information Society related policies (e.g. national strategies), output versus outcome, benchmarking, the advantages and disadvantages of official and private sources related to statistics for the Information Society.

A home page on the world wide web that will contain information related to statistics on the information society is being prepared. It will be linked to the ISPO home page/server.

2 ***research on concepts, definitions, variables, data collection and survey systems etc.***, necessary to understand the information society;

A program for this should be developed, initially based on the findings in the three sources and discussions in the Working Group and other relevant bodies. This program should be regularly assessed and revised. The Compendium (see point 4) should contribute to the program.

An element in developing this program is an more in-depth analysis and synthesis of the proceedings of the 83rd DGINS conference than has been possible up to now.

3 ***report on users need for information*** and ***establish a GUS*** *(an internal at the Commission users' of Statistics group)* for the Information Society to guide the development and if necessary, ***prepare a Council Decision*** on a Programme for Statistics for the Information Society.;

It has been decided that the DG XIII/ISPO interservice group on the Information Society will be the GUS.

A study on user needs is under way. The result will be used for further discussions with different concerned parties. A draft will be discussed in the meeting of the Working Group on Statistics for the Information Society planned for mid-November.

4 ***produce a comprehensive compendium*** of statistics in co-operation with concerned Commission Services and interested Members States by a more intensive ***use of existing data*** for publications addressing different themes;

The general objective of the compendium is to create the overall framework and "platform" for ***short*** and ***medium term*** activities concerning Statistics for the Information Society (IS statistics). A more detailed description of the objectives and contents of the Compendium is given in annex II.

An important background for the work on the compendium will be the documents and proceedings of the DGINS conference in Helsinki 29-30 May 1997.

A first framework for the development of Statistics for the Information Society in the form of a detailed and reasoned description of the structure and contents of the Compendium will be constructed. This framework is also to be used as a tool for data collection and inventory of existing data.

Examples of interesting approaches, studies or new ways of presenting existing data, statistics and indicators of relevance for a statistical description of the Information Society will be presented.

Drafts of these two reports on the framework and the examples will be discussed in the meeting of the Working Group on Statistics for the Information Society planned for mid-November.

5 ***pursue the launched COINS, AUVIS and Business Services projects*** comprising definitions, classifications and concepts; analysis of user needs; guidelines for data collection; methodological manuals; glossary; data base; dissemination;

These projects are managed as sectoral projects of their own. Questionnaire for data collection and updating of the COINS and AUVIS databases respectively have been sent to EU/EFTA Member Countries.

Two pilot studies - of telecommunications operators and service providers and of computer services enterprises - are currently being carried out.

A proposal for a revised CPA for Audio-visual services has been elaborated. A draft proposal for a revised CPA for telecommunications services was submitted to the Voorbourg Group in 1995 and is currently being tested in the pilot study.

6 ***establish a EU Statisticians Task force*** based on Finland and Scandinavian countries initiative;

Participating countries are (provisionally) Finland, Sweden, UK, Germany, the Netherlands, Italy and Hungary. It has not been activated yet, but will be so after the Working Group meeting planned for mid-November. The activities will be co-ordinated with the work in the OECD Statistical Panel.

7 ***assist on Statistical matters CEEC*** governments faced with the task of formulating their respective information society policies, in the context of the EU pre-accession strategy;

Eurostat participates in the EU-CEEC Information Society Forum. Statistical activities are included in the recommendations from the conference in Budapest 12-13 June 1997. The concrete actions are currently being discussed.

8 co-operate and co-ordinate with ***international organisations***, e.g. International Telecommunication Union (ITU) and OECD in order to promote the development of comparable international or global statistics.

Eurostat participates in the OECD Statistical Panel on GII-GIS, whose first meeting took place 12-13 June 1997. the co-operation will be intensified with the ITU and other relevant organisations like the European Audio-visual Observatory and European Information Technology Observatory.

INFORMATION SOCIETY: NEW WAYS OF WORK

An Explorative Study on the Consequences of New Information and Communication Technologies

Huub Meijers
MERIT

SUMMARY

The Summary is made by Eurostat/D2
The full report is available on request

Conclusions

This report is concerned with the consequences for statistics of the introduction and widespread diffusion of Information and Communication Technologies (ICT). It is explorative in nature and therefore limited in its coverage. The subjects being discussed can be categorised in two main topics: "Mismeasurement of Current Statistics" and "the Need for New Statistics".

Part I, "Measuring the Real Economy" deals with the ways statistics are collected and the way new ICTs are being viewed as the main sources for severe biases in existing statistics. This does not mean that statistics on investment, R&D, value added, employment etc. as currently collected, e.g. by the COINS database at Eurostat, the Communications Outlook by the OECD and national statistical agencies are not relevant and useful. On the contrary, these data give valuable insights in the processes currently taking place. However, familiar

concepts such as price indices are subject to severe biases due to the introduction of new goods and services, the rapid changes in the quality of these products and services, increasing price discrimination made possible through the use of ICTs and the diffusion of sectoral activities. Even rough estimates of the corrected Price Index for consumer goods indicate an mismeasurement of the rate of inflation of 0.5 to 1.5% per year.
The implications of such bias are significant as many (monetary) flows in our economies are indexed like wages, social security benefits, interest rates and affect all sectors, be it consumers, producers or the government. One needs only to think of how the Maastricht criteria for the EMU may be affected.

The recommendations which result from the discussion are diverse.

- **Speed.** Timely introduction of new goods and services into the commodity basket on which price indices are calculated will reduce the bias. This is especially true for "information products and services" for which the marginal costs and consumer prices decline quickly. Although there are some studies on the size of mismeasurement due to the delay at which products enter the commodity baskets, it is recommended to carry out a detailed study for a limited number of products to gain more insights in the importance of this delay. Moreover, such a study should also take new methods and procedures to improve price indices into account.

- **Price discrimination**. The consequences of price discrimination for mismeasurement can be reduced by measuring both prices and quantities on a more frequent basis. Currently little is known of the effects of price discrimination on the quality of statistics. Therefore it is recommended to investigate the role of price discrimination in the current statistics and study new methods to capture the price differences in the National Accounts.
- **Quality**. Although there is already some experience with adjustment for changes in quality by using Hedonic price indices, more efforts should be undertaken to increase the coverage of such indices. However, including a Hicksian style of price indices into official statistics will be rather difficult although case studies do show the relevance of such corrections. Product specific in-depth studies are needed to gain more insights into this type of mismeasurement. It is recommended to carry out such studies for goods. For services, and for information services in particular, the main problem is that the quality of the product is difficult to determine. However, for some products like computer software, it is expected that quality adjusted price indices can be developed. Therefore it is recommended to study methods to capture the quality of services.
- **Diffusion of sectoral activities**. The diffusion of sectoral activities implies that the sectoral specific dimension of the statistics will lose its meaning. To obtain insights into the importance of this phenomenon, the recommended study should examine all activities of (a limited number of) firms and should compare the results with the results obtained by following the "normal" procedures at which the activities enter the National Accounts. This gives insights into the size of the "misclassification" and could lead to a revision of the National Accounts.
- **Out-sourcing.** Further investigations of measuring the size of out-sourcing based on Input-Output tables is recommended. This includes the identification of the underlying assumptions regarding the pace of technological change and differences in prices within

each sector of industry. This could be followed by measurement of out-sourcing in all member countries by using IO-tables with a relative high level of detail.

In addition to what is presented above some topics related to the measurement of the real economy were discussed very briefly in the introduction of this report, i.a. investment and human resources.

- **The role of investment**. To inform on the knowledge generation process, it is recommended to study R&D spillovers and their impact on the quality of investment goods. Although there are some studies in this area, this has never led to general and uniform methods for capturing the spillovers statistically. Before the actual implementation of such an exercise, it is recommended to investigate the availability of data already included in our statistics and which might be used to compile quality indices.

- **Human resources.** Although the current literature on economic growth recognises the importance of human capital for economic growth, current statistics are not sufficient to give a clear indication of the size of human capital, nor its embodiment in products and services. Like the measurement of spillovers mentioned above, one could also think of creating methods to measure the quality of labour which is embodied in goods and services. Together with R&D spillovers, this could give some quantitative insights in the distinction between tacit and codified knowledge. In most cases, this can be done by using available statistics, e.g. labour force survey, input-output tables, trade data. The knowledge based economy puts high priority on information on linkages between human capital and economic activity. Studies should be launched on how to make better use of existing data and developing "alternative" methodologies for interpreting the role of knowledge workers (e.g. moving away from capital infusion to human capital) and to recommend new data requirements.

The second part of the report examines the way consumers and firms use the new ICTs focusing on the commercial use of the Internet. Consumer behaviour patterns are presented which compare users in Europe with the US.

Firm behaviour is presented on the basis of a survey carried out among Austrian firms who use the Web, and on the basis of a discussion of the experience with the Web and its features of a research and construction group in Finland. Finally, two scenarios present future organisational structures which are emerging due to the introduction of ICTs.

The consequences for statistics are diverse but sometimes obvious. Borders will be less and less relevant and in order to gather useful data, intensive co-operation between national and international statistical agencies is a condition sine qua non. Moreover, as the chains of different organisations involved in the production of single products become longer and longer, it will be more difficult to trace and to attribute all costs, R&D expenditures, employment, intermediate use etc. to the specific products. Detailed surveys will be needed to gain insights in these processes and developments.

From the findings presented in the second part of the report, we can deduce the following recommendations:

- **Consumers and the role of Internet**. It is recommended to issue a survey like the one presented in the report, which was carried out by GVU, to study the importance of the commercial use of the Internet and to identify obstacles. Because the GVU-survey is

focused on the US, it is recommended to issue a survey among European users of the Internat. Next to questions regarding the commercial use of the WWW, the questionnaire(s) should also contain some general issues which allow for a re-sampling of the results. As it is known that inhabitants in non-English speaking countries use the Internet less frequently than in English speaking countries, it is important to gain insights in the reasons for this. Therefore it is obvious that a European survey should be carried out in several languages. A survey issued through the Internet will only reach users by definition, which makes it important to accompany the survey with a "random sample" survey to reach the non-users. However, before carrying out a large survey, it is recommended to review all studies currently done in this area. Most of these studies are done by private research bureaux, mainly focused on research for marketing purposes.

- **Firms and the role of Internet.** It is clear that such data as obtained from the presented examples are not captures in current statistics. Currently available data, such as investment figures on ICTs, are not sufficient to gain insights into how firms actually use ICTs. From a policy perspective, it is very important to have good insights in the actual use of ICTs and the problems which firms face in implementing and using these technologies. The use of ICTs and the implication for firms could be captured by surveys among firms, possibly within specific sectors. Although it is not always possible for firms to attach exact numbers to each activity where ICTs are involved, firms are in general able to identify the importance of the introduction and use of ICTs for their organisation, e.g. cost reduction, increase of turnover, quality issues, strategic importance etc. As is the case for the consumers, a survey could help policy makers to identify both positive and negative influences of ICTs and thus improve the measures through which policy objectives can be achieved.
- **Networks and the blurring borders.** Although there are no quantitative studies in which the size and importance of virtual firms are described, it is recognised that international networks are going to play a significant role in the way production is organised. Whether the actual production is done by virtual firms or by real firms but in a (international) connection, it is important to gain insights into the way these networks are organised and to trace flows of goods and services. In this respect, at least two items are important: first, how international trade is captured by statistics, and second, the role of intermediaries in these networks. It is known that the trade of services are hard to trace in the current international statistics. On the other hand, services are typical products whose properties facilitate transport through electronic networks. This implies that traditional methods of measuring the size of imports and exports are not sufficient to capture the trade of "intangibles" made possible by ICTs. Comparing trade data with data obtained from the balance of payment is one way to deal with this problem but the quality of the resulting data is unknown. It is therefore recommended to study new methods on how to trace international trade of "intangibles".
- **The role of intermediaries in networks**. The role of intermediaries or brokers in networks of (virtual) firms is considered to play a crucial role for the functioning of these networks. Virtual firms are believed to play a minor role in the current economies. However, due to the role of ICTs, this is expected to change in the future. Therefore, it is recommended to study, or at least to start thinking of methods which can be used in the future to capture the activities of the networks and the brokers.

Background

The diffusion of ICTs has an important impact on the generation of knowledge, on the way work is organised and how goods and services are traded. Through the use of Information and Communication Technologies (ICT), the codification process has been accelerated whereas the spread of codified knowledge itself has become easier due to the presence of new ICTs. As the "technological contents" of goods increase whereas the amount of resources needed in the production process decreases, or does not increase at the same pace, the production costs decline relative to the embodied quality. This leads to products with a higher quality but lower prices - the so called "technology value paradox". On the other hand, production processes which rely heavily on tacit knowledge will not change significantly by the introduction of ICTs: the quality of output remains stable whereas there is no significant factor saving technological change. The codification of knowledge is a process that is located mainly in the goods producing sector but also in some services, e.g. software producers, (some) financial services. In this respect, the distinction between tangibles, intangibles and "real services", albeit based on the type of output produced, comes much closer to the differences in the production process itself as far as it concerns the use of codified and tacit knowledge.

Introduction

The report was prepared for the Statistical Office of the European Communities. The main topic is the consequences of the introduction and use of ICTs in our economies and how this can be captured by statistics. The study is of an explanatory nature and thus limited in size and scope. As the implications of the introduction of ICTs cover a very broad field of subjects, the report is limited to some specific items with significant consequences implications for statistics.

In general the implication of ICTs on statistics can be summarised under the following headings

- **The role of investment.** Measuring embodied and disembodied R&D spillover effects could be used to identify the process of generating knowledge. It is recognised that spillovers are valuable concepts in measuring and explaining economic performance.
- **Measurement issues on the direct and indirect role of ICTs on the quality of existing statistics**. It has been recognised that prices are subject to severe mismeasurement if the quality of products changes rapidly, if the number of newly introduced goods changes rapidly, and if price discrimination becomes a more frequently used instrument.

- **Trade and ICTs**. Through the use of ICTs the transferability of both goods and services increases whereas transaction costs decline. New communication infrastructures allow for direct contact between producer and consumer and will more and more exclude the role of intermediates, especially for services which are often transported easily through the newly available communication infrastructure. In this context trade applies to both the internal and external exchange of goods and services.

- **Internal organisation of work**. New communication infrastructures have effects on the way firms are organised. The recent growth in out-sourcing is often attributed to the widespread availability of ICTs, along with the emerging virtual corporations which change the ways firms produce. The question is whether new concepts and methods need to be developed to capture these phenomena.
- **Human resources.** Current statistics are not sufficient to give a clear indication of the size of human capital, its embodiment in products and services, or more generally, the linkages between skilled workers and economic activity. There are a number of ways to determine the quality of labour as an input factor into the production process, e.g. by level of education, by field of specialisation, or by occupation.

Given the nature and scope dictated by the explorative nature of this report it is focused on two areas.

The first deals with the measurement of economic activity within current statistics and statistical concepts, i.e. output, prices etc. A key point is the mismeasurement of output and prices. A brief investigation of the impact of out-sourcing on current statistics concludes this area.

The second part deals with the role of ICTs on the way enterprises are organised and on how firms (or organisations) communicate with each other and with consumers. The central element for this section is the Internet and Internet related technologies. This new way of work is not captured within the current statistics whereas it is highly important for policy recommendations. For statisticians, this implies a need for new concepts and methods and it will be a challenge to implement them in a short period of time.

The main goal of this report is to present an overview of the current state of the art and to provide some recommendations for further research. It is concerned with i) the problems which can arise in the current statistics, and ii) new statistics that can be valuable to gain more insights into how firms and consumers use ICTs.

Part I Measuring the real economy

The labour productivity growth in the service sector is lagging behind the labour productivity growth in the goods-producing sector. With reference to Griliches two, possibly complementary, explanations for this phenomenon are mentioned. The first is slower technological change in services which results from their intrinsically more labour intensive nature and from a potentially higher income elasticity of the demand for them. The second explanation is that the difficulties in measuring output and prices in the service sector leads to a mismeasurement of productivity growth.

Although the first explanation seems to be worrisome, the second is of crucial importance and could, if the measurement problems are solved, give an entirely different picture of the performance of the service sector relative to the goods-producing sector.

Next to the implications of mismeasurement for productivity analysis, finding better statistical concepts to measure real output has above all major important policy implications. This includes mismeasurement of price indices and therefore a mismeasurement of inflation.

This "inflation illusion" is widely attributed to the introduction and widespread diffusion of ICTs. Due to new technologies, new products and services are introduced on the market at a growing speed. The quality of these products and services increases considerably and consumers are able to expand their choice set, for instance through the Internet. All these effects have serious implications for statistics and in particular, price indices.

Diewert and Fox mention several aspects of mismeasurement in relation to the productivity paradox. Two of these aspects are directly related to the way data are collected: the introduction of new goods and services and the mismeasurement of service sector output.

New goods and services

The introduction of new goods and services is generally viewed as the main source of mismeasurement of price indices. There are several, not always independent, sources for this mismeasurement.

The delay with which new products and services enter the commodity baskets on which price indices are calculated is one main source of mismeasurement. In particular "information based" products will lead to a large bias. The main difference between these new types of products and services and the traditional products is the distribution of the fixed and variable costs in the production process. Another main difference is the costs of distribution. Next to the development and introduction of a traditional product, reproduction of it requires a considerable amount of input as a result of which the marginal costs will not decline very fast. Information based products and services, on the other hand, require extensive initial resources whereas the reproduction costs are nearly zero, i.e. the marginal costs for the very first product is tremendously high whereas the marginal costs for the second and subsequent products are nearly zero.

This difference in cost structure will also have implication for the prices of the products and services sold. The introductory price of information goods will be high initially but will then decline rapidly (intertemporal price discrimination) whereas the prices of traditional products tend to remain stable. But, as there is a considerable lag before a new

product or service enters the commodity basket on which price indices are calculated, much of this decline will be unmeasured.

Change in the quality of products is another source of mismeasurement. In general, the products in the commodity basket will be subject to changes in quality whereas they will be treated as the same product in the basket. As a result, quality changes are not captured and the price index will be biased upwards.

Diewert and Fox argue that new goods and services will increase the costs for producers and retailers whereas they will benefit consumers. On the costs side, they list six cost categories: i) the costs of basic inventions; ii) the costs of designing new capital equipment; iii) the costs of retraining workers; iv) inventory costs; v) selling costs and vi) the costs of product failure.

In general, these costs are all captured by statistics using the traditional accounting framework with the exception of the attribution of the costs to new products if firms introduce more than one product at the same time. The main problem arises on the benefit side.

The introduction of new goods gives consumers the opportunity for a variety of products, i.e. it enlarges the choice set. In general, this will shift the utility function outwards and the consumer ends up with a net gain. However, this gain is not measured. So on the one hand, the costs of introducing new products will be included in our statistics, while on the other hand, the current practice on the introduction of new goods will bias the benefits downwards.

Solutions to this problem are not easily implemented. From economic theory, the bias should be corrected by taking the shadow or reservation price for the new good into account. The problem is that indifference curves are not directly observable and that procedures and methods have to be developed to construct them.

Next to the role of ICTs on the number of goods and services introduced on the market, the recent introduction of the Internet, and especially the development of its “visual part”, the World Wide Web (WWW) has increased the choice set of consumers dramatically.

Another problem, which is related directly to the number of goods and services available, is price discrimination and price dispersion. The computerisation of retailing has made intensive use of price discrimination possible which leads to several, identical products, with different prices. For the correct determination of inflation, one should be able to capture all prices and all quantities sold at these prices.

The intensive use of ICTs will drive the production of new products and services; it will increase the consumers’ choice sets and it will allow producers and retailers to diversify their prices. These three effects will increase the mismeasurement of, for instance, the consumer price index.

Mismeasurement of output in services sectors.

Next to the number of new goods and services introduced on the market, the enlargement of the choice set, and their implications for statistics, Diewert and Fox list four main categories in which the mismeasurement of output in the service sector can be classified:

i) The treatment of margins. To measure the real output of a firm, one needs to deflate the value of the output and the value of the intermediate inputs (double deflation). In general, this is no problem for the goods producing sectors. Observing price and volume changes concerning services is very difficult, however. The current practice of the statistical agencies is very different with respect to this point.

ii) The treatment of interest, which has considerable effects on the output measures in industries like banking and insurance.
iii) The treatment of risk, which has effects on sectors where industry products are uncertain such as insurance, gambling and options trading industries.
iv) The measurement of complex multi-product industries, which is due to the vast number and the complexity of the output of many services like medical services, business services, recreational and sports services, educational services and telecommunication services.
By not taking newly created services into account, the actual value of output of these industries is likely to be underestimated. This problem will become more important as the number of different products of sectors increase and as the activities of different sectors overlap.

Diffusion of sectors and sectoral activities

Technological change changes not only the contents of services, but affects also the frontiers between activities. With reference to Petit and Soete, two main consequences are listed:

- Services have become much more dependent on economic activity. This is caused by the increased transferability of service activities in financial, communication and other business services and by the result of increased out-sourcing. The traditionally sheltered service sectors become much more exposed to international competition.
- Service sectors are subject to major structural changes due to internationalisation and technological change. These changes include:
  - potentially major shifts between sectors and services (e.g. retail banks offer a wide range of services electronically and expands activity into other sectors such as travel, insurance, entertainment and shopping);
  - new alliances and industrial groupings between different sectors (e.g. between media and communication, leisure and education, finance and computing etc.);
  - accentuation or the trend to globalise and to deliver services internationally;
  - increasingly close links between suppliers and providers which is supported by Electronic Data Interchange (EDI) and by improved and more accessible inter-enterprise networking and connectivity;
  - greater opportunities for SMEs through universal access;
  - greater openness and participation of customers, consumers and business.

The moving borders between sectors and the alliances and industrial groupings between different sectors will have major implications for statistics. As indicated above, the measurement of output and value added in real terms depends on accurate measurement and assignment of actual costs to the various goods produced. However, if borders between sectors continue to blur, the assignment of costs and sales to different products and services will become much more awkward and will undoubtedly lead to mismeasurements. Next to this problem, as firms from different sectors will supply “the same” good, it is likely that there will be differences in quality and in prices, which implies another source of mismeasurement. Moreover, new products will emerge and will become widely available as a result of this diffusion of sectors.
Activities which are traditionally carried out by a number of different firms and for which data are often collected in different (sub)sectors are increasingly carried out by one firm and sold as a package, e.g. travel arrangements together with currency exchange,

insurance, hotel or car reservations etc. This has severe implications for statistics as the borders between sectors and sub-sectors break down. Thus, whereas there is a need for more detailed data, see e.g. NACE Rev.1 versus the original NACE classification, it will become more and more difficult to collect data at a detailed level as the activities of the firms diffuse.

Outsourcing and the consequences for statistics

One of the changes in the way firms organise work attributed to new ICTs, is the shift of non-core functions from the company to other, more specialised organisations. Because new technologies allow for easy and cheap communication between firms, and because internal information is more and more available in digital format, it becomes more attractive for firms to out-source those activities which are not their main activities, i.e. ICTs have accelerated out-sourcing. This can lead to cost reductions; it allows for more flexibility and firms and management can focus on their core activities.

To measure the extent of out-sourcing, we can examine the input-output tables, and especially the intermediate use. In the national accounts, out-sourcing will reduce the value added of the firm which moves production to other firms whereas its intermediate use will increase. The firm which takes the work over, will increase value added. If there were no cost reductions and if productivity (for labour as well as for other inputs) would be the same for both firms, nothing would change at an aggregate level, i.e. out-sourcing does not really affect the way the national accounts are constructed. Moreover, if the IO-tables have a fair level of detail, out-sourcing can easily be traced. The occurrence of out-sourcing where both contractor and subcontractor are within the same sector cannot be traced by using IO-tables. This can be a significant problem if the level of sectoral classification is not very detailed.

Part II The Implications of Information and Communication Technologies for Firms and Consumers

This section looks at the way consumers and commercial organisations use new ICTs and on how statistics might deal with this new way of work. The use of these new technologies is diverse and it is not possible to review all aspects in this report. In order to gain some insights in the processes and methods which are currently being used, it was decided to deal with this by summarising some aspects by example. The examples are based on different uses of the Internet. Finally we will summarise two scenarios on future organisational structures where some examples for which the introduction of ICTs is important are listed.

The commercial use of Internet: a survey among users.

The Internet, and especially its visual part WWW, has become an important medium for firms doing business. This can take the form of collaborating with others, gathering and/or publishing information, selling products or services, internal communication, providing vendor support and communication etc. However, there is little known about the consequences of these new ways of doing business, relative to the traditional ways.

Information on how customers use the Internet is of interest for answering questions on the commercial use of the Net. We therefore analysed this, making use of a global survey among Internet users. This survey is carried out bi-annually by the Graphics, Visualisation and Usability Center (GVU) of the Georgia Institute of Technology and the resulting data sets are publicly available. The results of the last GVU survey, carried out in October-November 1996 is discussed in the following.

GVU use a self-selection technique among Internet users and a non-probabilistic sampling method. With self-selection more frequent users are expected to hit a request to join the survey more often than less frequent users. The survey is in English and this may discourage non-English speaking users. There is no method available to check for this bias, except for a geographical confrontation of the respondents and the distribution of users from other sources.

More than 15 000 people responded to the survey with a huge bias towards the US. 82.7 percent of the respondents came from the US, 6.2 percent from Europe and Canada &Mexico respectively and 2.9 from Oceania.

If we look at the number of respondents within the EUR15 and relate these numbers to the distribution of the population we see that Finland, Sweden, UK, Ireland, the Netherlands and Belgium are over represented. The number of respondents from France, Spain, Portugal, Italy and Greece are very low whereas Germany and Austria are in between.

From the results of the GVU survey and from other sources it becomes clear that the commercial use of the Web and other on-line services has increased rapidly in the last years and this trend will probably continue. The GVU survey shows that the WWW and other on-line services are still primarily used for leisure (browsing and entertainment) but that shopping through the Web is becoming more and more important.

Interestingly, users from Europe and the US do not show the difference in purchasing and seeking behaviour as might have been expected. Although the commercial use of Internet is more common for American users, and they spent more on purchases through the Web, the correlation of the seeking and purchasing behaviour between the US and Europe for several products is very high.

This survey shows that the Internet and other on-line services are used more and more for commercial purposes. Because of the non-random sampling method used by GVU and because only (frequent) Internet users are captured within this survey, it does not give a representative overview of the actual behaviour. Other techniques, such as resampling of the entire sample such that the new sample is representative of the entire population of users would be useful.

The survey does not show whether products/services are imported or supplied by domestic firms. Especially for services and products which can be downloaded through the Web, this would be useful information since it is not captured by trade statistics. The current practise of statistics regarding these products/services is to compare trade statistics with the balance of payments but this is a very indirect way of measuring. Moreover, the classification system of the balance of payments differs from the trade statistics.

Finally, this is an example of how surveys can be carried out through the WWW. The main benefit is a reduction of the survey and mailing costs and data are immediately available in digital format. The disadvantages of this method is the lack of sample control

of the survey and the non-random sampling techniques. However, the latter can be adjusted by using re-sampling techniques and by comparing characteristics of the sample with other sources, like Census data. It is recommended to carry out surveys limited in size and depth with random sampling techniques, next to surveys through the Web.
From a policy perspective, a survey like the GVU-survey provides information on the commercial use of the Internet and identifies some obstacles such as payment through the WWW. Because the GVU-survey is focused on the US, it is recommended to survey European users of the Internet. Next to questions regarding the commercial use of the WWW, the questionnaire(s) should also contain some general issues which allow resampling of the results. Because it is known that inhabitants from non-English speaking countries use the Internet less frequently, it is important to gain insights into the reasons for this and the survey should be conducted in several languages. A survey issued through the Internet will by definition only reach users, so it is important to accompany the Internet survey with a "random sample" survey to reach the non-users.

New ways of organising work

Next to the role of new ICTs for the consumer behaviour, ICTs have important implications on how firms organise work and how they use these new techniques. This section will discuss some of these aspects where again the focus will be on the role of Internet. The emergence of "virtual enterprises" points to a radical new way of organising work and this is a main item for this section.

VIRTUAL ENTERPRISES

Although the concept of virtual enterprises/organisations is not new, the increased availability of ICTs makes communication over distance easy which will result in an increasing number of virtual firms. There are many organisational concepts which can be understood as being virtual, so a few definitions are listed.
The term "virtual firm/organisation/corporation" is not well defined, but the main characteristic of a virtual firm is that it has no physical location. Its temporary character can be another main point, but this is not seen as a key element. The question is in what way a "virtual firm" differs from a "real firm" in the sense that traditional methods and concepts used by statistics agencies may not capture adequately the main characteristics of these firms.
If a "virtual firm" has a legal entity, which will be the circumstance in most cases, traditional measures like output, employment, wages, value added, intermediate use etc. can be traced in the same way as is the case for the "real firms". As in the case of "real firms", if there is no legal entity, it will be difficult to trace the existence of "virtual firms". However, the main problem of the virtual firm will be its size. Small firms are in general excluded from many statistics, and as virtual firms tend to be small, they will not be captured by the statistics. It should be noted that the size does not only refer to the virtual firms. As indicated above, the introduction of ICTs increased the number of small real firms for which the same problem holds true.
Policy makers and other users of statistics may be more interested in the way these new firms are organised and in which way active policies can be developed to reach certain goals such as increased employment. To some extent, virtual firms are captured in the current statistics, as discussed above, but this does not imply that they are comparable to

traditional firms. In contrast, a virtual firm is based on networks and its output is mainly knowledge-based. It is therefore useful to gather information on these networks and on the human capital involved in the production process.
As discussed in the introduction of this report, new methods to capture the embodiment of human capital in products and services could be developed. By doing so, one can identify sectors where the production process is mainly knowledge-based. Moreover, the networks through which firms are organised are not visible in current statistics. This holds true also for the way firms use ICTs.

INTERNET USAGE BY AUSTRIAN FIRMS

A survey on the use of Internet among Austrian firms is presented. The survey contains two sections: one with questions on the industry in which the firm is active, the number of employees, the age of the firm, its legal form etc.; the other Internet specific section includes the date of introduction of e-mail and WWW, through which provider access is obtained, which services are used, which departments use the Internet, the strategic importance etc.
Sixty-five firms were surveyed, of which 55 firms provided responses, so the sample is rather small. Responses were relatively high from the services sectors. The survey shows that the use of Mail, both within the firm and outside the firm are important. Surprisingly, the use of external mail has a higher score than internal mail, but this could be explained by the large number of small firms in the sample. Another remarkable high response is the use of the File Transfer Protocol (FTP) which is used to download files. The remarkably high score on the plans to install a WWW server in the coming years implies that a large number of firms are willing to act as information and/or service providers.
The result of the survey confirms the notion that the introduction of the Internet-facilities within a firm is viewed as a strategic advantage in which the ability to serve customers faster and better is emphasised. With respect to the reduction of costs the importance of Internet is less strong.

INTERNET IN CONSTRUCTION PROJECTS AND RESEARCH IN FINLAND

A Finish report on experiences from using Internet as an environment for distributed teamwork and the development of the use of Internet in the construction industry in Finland is presented. The report shows how a multidisciplinary team uses the Internet.
The Internet is being used by the team for WWW, e-mail and FTP showing that the Internet can be used effectively for several tasks. The learning costs of the team are low mainly because of the computer literacy of the team members. Also, the installation costs experienced are rather low, due to standardised hardware and software. The benefits can be summarised by cost reduction (time saving) and increased quality.

* * *

Current available data, such as investment figures on ICTs, are not sufficient to gain insights into how firms actually use ICTs. From a policy perspective it is important to have useful and timely information on the actual use of ICTs and especially the problems which firms face in implementing and using these technologies. The use of ICTs and the implication for firms could be captured by issuing surveys among firms, possibly within

specific sectors. Although it is not always possible for firms to attach exact numbers to each activity where ICTs are involved, firms are in general able to identify the importance of the introduction and use of ICT for their organisation, e.g. cost reduction, increase of turnover, quality issues, strategic importance etc. As is the case for consumers, such surveys could help policy makers to identify both positive and negative influences of ICTs which can improve the ways in which policy objectives cam be achieved.

Two Scenarios for 21st Century Organisations

Although the future implications of ICTs on the way firms are organised are hard to forecast, it is possible to give some scenarios which deal with this topic. This could give some insights into the way statistics should be changed to incorporate these new ways of work. Below are the two scenarios presented. These are included to give an impulse to the mental process concerning future statistics.

The two scenarios, developed at MIT, focus on firm size. The scenarios are using two extremes: very small companies in the "Small Companies, Large Networks" scenario and very large companies in the "Virtual Country' scenario. The two scenarios are summarised and some additional examples are supplied. As the "Small Companies/Large Networks' scenario has the largest impact for statistics, we will discuss the "Virtual Country" scenario very briefly.

SMALL COMPANIES/LARGE NETWORKS

In this scenario, every task is performed by small teams of independent contractors or small firms. They are linked by networks and come together in temporary combinations for various projects. For a new project, requests for proposals are issued or jobs to be done are advertised, firms respond, candidates are selected, workers are hired. When the work is done, the combination disperses and each entity searches for a new project.

This way of organising work is highly dynamic and is well-suited for rapid (technological) change. However, there is still need for some social interactions, some stability, income smoothing and a place for learning. This is covered by various independent organisations which evolve from professional societies, alumni associations, unions etc.

There are two key elements to this scenario: "the fluid networks for organising tasks and the more stable communities to which people belong as they move from project to project". Several examples of current organisations which fit in this scenario are mentioned: the film industry, textile production in the Prato region of Italy and some other manufacturers.

Until the 1940s, the film industry was organised in a traditional, on mass-production based way. A new system was introduced in the 1950s, in which the role of large firms or conglomerates was reduced to finance and distribution. The actual production process shifted away to a number of small firms organised on an ad-hoc basis. The number of talent agencies (brokers) increased significantly and served as the necessary intermediates in such a network.

The key element in the Prato scheme is the brokers who act as conduits between the customers and the small firms. By connecting the appropriate firms to meet the customers request, they effectively direct the design and the manufacturing process and they even

created an electronic market in which capacity utilisation is traded like an ordinary commodity.

Other firms with similar characteristics are also listed. Semco in Brazil, a manufacturer of marine and food-service equipment was forced to cut costs. To survive, the management decided to encourage employees to form satellite enterprises which could use the companies' facilities. The parent firm employed 500 people in 1990 and this was reduced to 200 in 1994. Employment in the satellites was also about 200 and about 50 people were working for both Semco and the satellites. This is an example of rearranging work into several individual companies with the main company still providing some facilities.

Athletic shoe producer Nike kept only the design and marketing functions in-house whereas all other tasks are out-sourced. Another example of radical out-sourcing is the personal computer display division of the Finish firm Nokia. In 1995, that division accounted for sales over $150 million US with only 5 employees.

The examples given above are all older established firms who changed their structures. There are also new firms born from the small firms/large networks concept. An example of such a firm is "First Virtual Corporation" which has responsibility for only two functions: developing technology and negotiating agreements with marketing partners to sell its products. The actual production process, accounting and product support are out-sourced or produced by its (temporary) partners. In 1996, this company listed revenues of $50 million US with 35 employees.

Examples of European initiatives include the German Connector, Gesellschaft für Beratung und Kommunikation mbH. which is a virtual company in the sense that the employees are spread all over Germany and are connected by the Internet, and the Finish EVENt, with many partners in Europe, which started an European Virtual Enterprise Network. The network gives participants easy access to international contacts and fosters new business networks on an international level. Next to its function as a broker, it offers training on using new information technology and electronic commerce.

VIRTUAL COUNTRIES

In contrast to the "small firms/large networks" scenario, this scenario is based on the notion that some large firms expand their activities such that global conglomerates emerge.

The large vertically- and horizontally-integrated firms are the key element in the Virtual Country scenario. The world economy is dominated by large conglomerates which operate across a number of industries. There are a small number of core firms, which have a large number of permanent and semi-permanent relationships with smaller supplier firms. The industry structure can be described as oligopolistic and brand names are highly important. According to the MIT group, employees stay within one main conglomerate but may move around the world to work on several different projects.

The company offers "life maintenance" requirements to their employees and employees are expected to buy only company-affiliated products. Examples of this can be found in Asia, where the *keiretsu*'s produce a large variety of products and where employees only sporadically buy products from the competing *keiretsu*. The current merges in e.g. the software, media and film industry, in telecommunications, the computer industry etc. shows a trend towards larger companies or conglomerates of companies which produce different products.

* * *

These two scenarios are presented as separate extremes. However it is plausible that both scenarios can and will exist next to each other - the large conglomerates of firms with a small core surrounded by many satellites and the small firms who operate in larger networks. At present, there is no indication that one of the two versions will act as a "natural" attractor or that coexistence is a non stable equilibrium.

To conclude, the implication for business processes in both scenarios are presented in the table below. This helps to identify statistical problems which may occur in the future. As noted above, the scenarios are two extremes and actual developments of the way firms are organised is highly uncertain. Because of this uncertainty, the possible implications for statistics are not discussed in great detail but some general comments are given. The detailed implications are left for the imagination of the readers.

The consequences for statistics are diverse. In the small firms/ large networks scenario, statistics should cover all firms, irrespective of their size, and should be able to trace and describe the networks through which products and services are produced very quickly. As the borders will not be that relevant for the networks themselves, intensive co-operation among countries and an integration of their statistics is a condition sine qua non. The intermediaries, through which the networks are tied together, are of crucial importance in this scenario. The brokers function as mediators between both supply and demand and between several firms or individuals who will carry out the job. If this scenario comes true, it is useful for statistics to capture the activities of the brokers.

In the virtual country scenario, the need for further co-operation among countries holds true but a main problem of such organisational forms is the attribution of all costs, sales, investments, R&D expenditures etc. to specific departments or products. Specific surveys and in-depth studies will then be needed to gain insights in these processes and developments.

Business process in the MIT Scenarios		
Process	**Scenario One: Small Companies/Large Network** External transactions favoured	**Scenario Two: Virtual Countries** Internal transactions favoured
Product development	• design undertaken by dedicated firms and individuals, with no fixed organisational link between engineering team and manufacturer	• design and manufacturing controlled by the same organisation, to ensure manufacturability and because uncertain intellectual

	• manufacturability issues addressed by real-time concurrent engineering over networks • secure intellectual property regime enables disaggregation of design and manufacturing	property regime allows full value to be extracted only via embodiment of design work in physical products
Supply Chain	• ad hoc "extended virtual enterprises" created on project-by-project basis • economies from flexibility and responsiveness outweigh costs of continual re-assembly of supply chains	• permanent or semi-permanent keiretsu-style partnerships between major manufacturing companies and their families of captive suppliers • long-term relationships minimise supplier selection costs on new products; buyer-supplier co-operation allows cost-reduction over life of production runs
Manufacturing	• specialised manufacturing firms undertake small batch orders for wide variety of customers (brokers, design shops, consumers placing direct orders) • manufacturing capacity traded like commodity on electronic networks	• manufacturing process directed by large conglomerates, which rely on close co-ordination with supply chain firms within their "extended enterprise"

Marketing	Three potential alternatives: • brands remain important, but brand-holders contract out manufacturing/distribution and serve solely as quality certifiers • brokers (including intelligent software agents) replace brands as primary means of providing quality assurance to consumers • information so abundant that self-regulated "swarming" activity by consumers obviates need for brands or brokers	• large conglomerates release continental stream of new products under established brand names • conglomerate's legal staffs zealously protect trademarks and brand names
Finance	• reliance on diverse capital sources, including accumulations of small sums from many parties, invested directly or through extensive	• majority of investment capital obtained from retained earnings of large corporations • equity in firms closely held by ESOPs and employee pension

	network of intermediaries • real-time valuation and trading via Internet of shares in ad hoc, project-based ventures	funds, resulting in very limited public trading of shares
Co-ordination	• networks operate without central direction or control; self-organising mechanisms (market transactions, standards) serve as primary means by which co-ordination achieved between various entities • widely accepted standards serve as "constitutional framework" enabling efficient, low-cost transactions between variety of entities working together on project basis • standards set by three means: - market leader - industry co-operation - emergence out of practice	Two primary alternatives: • traditional command-and-control hierarchy with management playing major role in setting strategic direction and allocating resources • decentralised "federation of companies" with many small, stand-alone business units operating with great autonomy; management establishes mission and overall policies, facilitates collaboration and organisational learning

Compendium
on
Statistics for the Information Society

Objectives

The overall objective of the compendium or compendia is to create the overall framework and "platform" for ***short*** and ***medium term*** activities concerning Statistics for the Information Society (IS statistics). This objective can be subdivided in three main areas as follows:

I. to meet the immediate demand for basic data/indicators/facts on the Information Society

II. to be a means of exchange of information and experiences by making an inventory of projects (done, on-going and planned) of relevance for IS statistics.

III. a) to define the scope and content of IS statistics

b) to arrive at means and methods for mapping, measuring and analysing the Information society c) to set up a list of needs for development of concepts, methods, indicators etc.

The documents and proceedings of the DGINS conference in Helsinki 29-30 May 1997 are an important background for the work on the compendium.

Contents

The compendium will be split into three parts, each corresponding to one of the three objectives.

Part I. "Databook"

A first draft of the contents and structure is given in the Eurostat/D2 document "Compendium project on the Information Society. Outline" Doc. S6-IC/97/04.En. The "Databook" part of the compendium will be based on already existing sources.

The first draft of the contents is as follows:

Chapter 1, the "**Introduction**", gives an overall view of the sector and cover all the member countries and, perhaps, some other countries of major interest.

Chapter 2, the "**Infrastructure**", describes the material prerequisites for the information society; telecommunications networks, equipment connected to it, broadcasting and receiving device etc.

Chapter 3, the "**Enterprises and business in the information field**", studies the subject from the enterprise point of view; turnover, employment etc., classifying the units according to the industrial classification NACE Rev.1.

Chapter 4, the "**Production of and trade in information goods and services**", contains production and trade data according to the CPA, using HS classes for more detail, where necessary.

Chapter 5, the "**Employment in information occupations**", studies employment from employees' point of view, in addition to that of the employer in chapter 3.

Chapter 6, the "**Education**", is dedicated to the educations and degrees related to information technology as well as vocational and adult training, whether financed by employer or someone else.

Chapter 7, the "**Use of information technology**", describes the use of communication and computing equipment at work, at home and at leisure.

Chapter 8, the "**Use of information products**", has a more market oriented view on the information products specifying the product groups and the user groups.

Chapter 9. **Annexes**. A more comprehensive study of the communication and audio-visual sectors, based on the COINS and AUVIS, could be presented in annexes.

The first part of the work on the "Databook" consists of defining (provisionally) the scope of the IS statistics in terms of codes in different statistical classifications, like NACE Rev.1, CPA, HS, ISCO, ISCED etc. A framework in the form of a detailed and reasoned table of contents i.e. a synopsis with a short description of the phenomena and issues addressed as well as a list of data and indicators need will be elaborated. This framework will be designed in such a way that it can be used as a tool for data collection and inventory of existing data.

The next step will be the collection of existing data and statistics as well as information on sources. Sources for this data collection are

- Eurostat
- DG XIII
- Other concerned Commission Services
- Other Community institutions, like the EIB
- International organisations, like the OECD, ITU, UNESCO, ILO, IMF, WTO
- The Member States
- Professional organisations

The third step is the drafting of the publication including necessary definitions, methodological and other meta information. This part will draw upon existing Finnish and Canadian documents and on the activities of the OECD Statistical Panel on Indicators for the Information Society.

Part II. "Project Book"

This part of the compendium should contain commented lists of projects with bearing on Statistics for the Information Society in Eurostat, DG XIII and other Commission services, in Member States and elsewhere. The projects searched for should concern

- surveys and other data collection activities
- methodological development of definitions and concepts, methods, including data analysis,, and data collection systems.

The information for the "project book" will be gathered through an inventory covering the same sources as the "data book".

Part III. "Methods Book"

The purpose of this part is to sum up and make a synthesis of the current "state of art": user´s needs, the current state of knowledge, research and existing theories of relevance for IS statistics.

The proposed content is as follows:

- The scope and content of IS statistics should be discussed, analysed and defined with regard to user´s needs, neighbouring concepts like the knowledge based society etc.
- Means and methods for mapping, measuring and analysing the Information Society should be invented, discussed and evaluated.
- How official and un-official statistics might be integrated should be analysed and the problems related to such an integration be analysed.
- The needs for development of concepts, methods, statistical and analytical tools should be discussed and suggestions for future work be put forward.

The "methods book" will be one input to the research and development programme according to point 2 of the Eurostat Action Programme for Statistics for the Information Society. Eventually this "Methods Book" might be developed into a *manual* for Information Society statistics. It should contain at least a glossary of the terminology used and a list of information society relevant classes in the various standard classifications.