



Statistics and Indicators on the Labour Market in the eEconomy

Is ICT transforming the world of work?

And how to know about it?

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Part 1

Inventory report

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Introduction

General considerations on organisational panel surveys

The first step to be undertaken in our workpackage 4 was to make an inventory of existing organisational panel surveys with respect to the use of information and communication technologies (ICT) and its relations to the labour market from an establishment perspective. The purpose of it is to know about existing approaches to gain micro-level data on the labour market in the eEconomy, and to learn from their experiences before trying to improve the micro-level labour market monitoring processes by developing a new ICT questioning module and enhancing cooperation with stakeholders and scientists.

Contents:

1. Introduction: general considerations on organisational panel surveys
2. Benchmarking inventory of ICT-related organisational surveys
3. Conclusions

The outcome of this first step is presented now in this report.

In this introduction we'll have to make some considerations on socio-economic contexts, history, definitions and concepts, classifications and types of establishment surveys in general in order to give a good background for the following inventory and benchmarking of establishment surveys in chapter 2, which concludes with a special focus on the integration of ICT items into the current organisational panel studies. Chapter 3 will give a brief summary, try to draw some conclusions and give some recommendations for further organisational research.

1. History in short terms

Panel surveys in the social sciences are already looking back on about seven decades of history now (first mentioned in Rice, 1928; first systematic discussion in Lazarsfeld & Fiske, 1938; for an overview see Meyer & Hermanns, 1987), but this counts only for individual or household panel surveys. The history of organisational panels is much shorter. The first organisational panel survey we know about was the Workplace Employee Relations Survey (WERS) of the British Department of Trade and Industry, which started in 1980, due to the strong British tradition in investigating industrial relations items on enterprise/workplace level. Soon it was followed by the Center for Economic Studies of the US Census Bureau in the mid eighties (McGuckin, 1995), where panel datasets were formed out of different surveys and censuses, and by the Japanese research and development panel which started in 1987. The beginning of the 1990s faced the emergence of many organisational panels, most of them in the early industrialised countries.

2. Reasons, contexts and backgrounds

The actual reasons for the implementation of organisational panels survey differ from country to country; they must of course be seen in the own specific contexts of each nation's policy towards labour market, industry, technological and organisational innovation. But there are some common structures behind those differences. Most of the organisational panel surveys owe much gratitude for their existence to at least one of the following problem contexts within

Problem contexts:

- Special labour market questions (demand side)
- Technical and organizational innovations
- Human resources problems

the discussions of scientists and policy makers: Labour market questions, innovation behaviour and human resources problems.

The German IAB panel for example is closely related to the rise of labour market questions which could not be answered by highly aggregated statistics of previous times, especially those concerning the behaviour of employers

within the labour market. We suppose that many European organisational panel surveys are related to those kinds of questions, as for example the proceedings of the Eurostat (1995) or the CAED 1996 and 1997 conferences show (Eurostat, 1995; Laaksonen, 1997; Biffignandi, 1999). But there are some other lines of origin: In the eighties it became clear, that the innovation activities play a key role for the survival of enterprises as well as for the position of a nations economy in the increasingly competitive world market. This counts for technical as well as for social/organisational innovation, for example see the debates on Lean Production (Womack, Jones & Roos, 1990), or on the New Models of Production (Kern & Schumann, 1984). At least one Japanese and three German panel surveys are closely related to those problems. The third line are human resources items, which led to the foundation of some of the US-American panel surveys, such as Huselid's panel (Huselid & Rau, 1996) or the National Employer Survey. But there are still some organisational panel studies which do not fit into that scheme properly. Their emergence has to be explained by either very specific national contexts or by other causes, which are not so much related to specific debates, but to more general contexts, which are to be examined now.

In the late seventies, most of the early-industrialised countries had had developed statistical bodies on a highly aggregated level, consisting of both register data, administration data and/or surveys of different kind. As Laaksonen (1997) or Nanopoulos (1995) point out, economists were unsatisfied with that situation. The backgrounds for this are to be seen in the development of economics and economical policies as well as in the developments within the economies itself. Let's start with the last one, in short and somewhat simplifying terms: Since the mid-seventies the early industrialised countries are facing not only economic change, but also rising and persisting unemployment, caused (1) by rationalisations due to the microelectronic revolution and (2) the limitation of economic growth, (3) which caused a change within the world market from expansive to expulsive competition, accompanied by (4) a shift within the international division of work due to the emergence of the lately industrialised countries on the world market for industrial and even capital goods (Promberger & Trinczek, 1996). This was to put not only the demand side on the labour market but also the enterprises' innovation activities into the focus of economists, who had to give reasons and advices concerning economical change. The need for empirical data on enterprise level began to rise, being strengthened by coincident developments in economic theory, which was undergoing the neoclassical turn at that time, putting more emphasis on enterprises as key actors of the economy and therefore breeding and raising methods and data for research at enterprise level. This went together with a growing internal diversity not of paradigms but of methodological approaches or subdisciplines within economics, such as econometrics and labour economics, leaving the macro or 'speculative' level behind, calling it a kind of 'traditional' economics (Laaksonen, 1997, p. 3). Politics in some countries took also a turn at that time, implementing neo-conservative governments in many early industrialised countries, who emphasised the entrepreneur as a main actor of society, holding the key to innovation, success and prosperity of the economy and therefore of society as a whole, according to Schumpeter's thought of 'creative destruction' (Schumpeter, 1942). Establishing well working markets to be better than compensating economic problems by state activities was the creed of Reaganomics and Thatcherism as the leading western policy patterns of the early 1980s. Whatever one may think about it, the early 80s brought in fact a renaissance of the entrepreneur and enterprises within politics and economics, which turned out to be a good political background for the kind of micro-level research we are talking about here. And, while focussing on enterprises, establishments and organisations, not only their demographics but also their biographies came into interest, what raised the need to do longitudinal analysis on micro-level. At least in Europe this development was supported very much by the European Commission, who funded many research projects, programmes and scientific conferences in order to improve and enhance the statistical system in the EC with respect to the European unification process.

3. The other side: reasons for the absence of organisational panel surveys

In many parts of the world we could not find any organisational panel surveys or even organisational surveys at all and this seems to be not a mere accident. To our opinion there are some structural reasons for the absence of longitudinal surveys at micro-level in those nations; three socio-economic ones and one of a more cultural nature.

The existence of a *huge informal sector* within many of those economies seems to prove as a great obstacle, because the results of surveying only the formal sector leave a blind spot too

- Huge informal sector
- Short life period of enterprises
- Fragile and turbulent economies
- Different needs of stakeholders, other traditions in economics

big. And questioning the informal sector is not so easy, because its informality is partially corresponding with illegality or at least fear of taxation and control. We can curiously wait for the Chinese experiences in the next few years, because right now they are planning to survey the informal sector.

The *short life-periods of many establishments* lead to very poor survivor rates in longitudinal analysis of the panel type. A higher stability of establishments may in many

economies only be found among state- or foreign-owned enterprises, very big enterprises and those, who require a high amount of investments in capital goods and equipment. Therefore, if we can find any enterprise statistics at all in Latin America or parts of Asia, they usually focus on Mining, heavy industry, state-owned or newly privatised enterprises. On a first glance the 'Fortune 1000' type of survey would also make sense there, if stability of enterprises was the only dimension taken into account. But first, this is not a real longitudinal survey, and second, this type of surveys is in fact strongly connected to economies with a high development of services industries, especially enterprise-related information services for commercial customers.

The rather *fragile and turbulent economic situation* puts a strong emphasis on the enterprises' activities to survive, many of them would not spend much time by participating in surveys. That also leads to a low response rate.

Other needs and traditions among statisticians, economists and politicians also seem to play an important role for the absence of micro-level analysis. Stakeholders and scientists in lowly industrialised countries face a range of problems of a very different kind compared to their colleagues in early-industrialised nations. They are for many reasons used and forced to do macro-level analysis in terms of development and underdevelopment. Industrialisation, urban and rural development, improvement of the fundamental living conditions and building a stable basic infrastructure are still on the agenda there. Traditional macroeconomics, sometimes in terms of some kind of academical neo- or post-Marxism or Keynesianism are therefore still present among scientists especially in Latin America, Asia and Eastern Europe.

4. Characteristical forms and levels of labour market statistics worldwide

Levels of economy statistics worldwide:

- Highly aggregated administration or census data, crude unemployment statistics, no micro-level analysis, enterprise statistics simple and limited to sectors of special stability and interest
- *Plus:* Enterprise-level statistics of all sectors, elaborate labour market statistics
- *Plus:* Combined enterprise and labour market statistics, sometimes longitudinal analysis on micro-level possible

As shown above, there are many contexts and reasons which lead to development and practice of survey- or even panel datasets on organisational level in the early industrialised countries as are reasons for their absence in low- or lately industrialised countries. But not all of the investigated countries do properly fit into that two-fold structure. For example, some post-socialist countries did already or are just developing enterprise surveys, or there are at least good reasons to expect them to do so soon. The same counts for some newly industrialised countries which were able to overcome the restrictions mentioned above

This leads to a *three-level structure* of a typology of economy and especially labour market statistics: Statistics of newly-, low- and non-industrialised countries are mostly limited to the highly aggregated type, collecting administration or census data, focussing on production of commodi-

ties and services in the whole, with some selected sectors (Mining, Agriculture, Construction), urban/rural breakdowns, foreign trade statistics, population and just simple unemployment statistics, sometimes with a regional breakdown. Enterprise data beyond the bare numbers are rare, only administrative fiscal or ownership data are available for special sectors. Because both enterprise and labour market data are collected only on a rudimentary and highly aggregated level, no one can even expect a connection between them. This is the *basic level* of economy and labour market statistics. Most countries in Latin America belong to this type, also many Asian countries and nearly the whole of Africa. Survey data are very rare there, and that counts even more for repeated or even panel surveys. We are not sure, whether one of the existing international establishment surveys can really fill this gap in some way.

The *second level* is, when there is in addition a kind of enterprise statistics that provides some more basic informations, such as average wages, sector, size or more, and a more elaborate kind of general labour market statistics, providing informations on not only on the numbers unemployed, but also on occupation, age, gender, and maybe even contractual forms of employment. China and Russia are good examples for entering level 2 soon, while South Korea sure is on level 2.

The *third level* is reached if those statistics can be linked together as well as to additional surveys with special themes. Longitudinal analysis on micro-level and panel methods develop usually out of level 3. This can be found only in Europe, Northern America, Australia and Japan at present. Hungary is the only post-socialist country which we know sure to be at level 3.

This scheme, especially placing the world's nations' labour market statistics special levels has of course to be regarded as dynamic and surely somewhat incomplete due to our short investigation time. Despite this preliminary character we nevertheless decided it to be helpful as a background structure for investigating the feasibility of organisational panel surveys on ICT and labour market items, because implementation and enhancing ICT panel research has to be embedded within a special set of conditions, which have to be analysed within this report.

5. Funding and institutional responsibility

Another important dimension for implementing ICT panel surveys on organisational level is their background with respect to funding and responsibility. Due to this *background*, we can distinguish three types of surveys: The governmental research type is usually conducted by statistical or other authorities, or in their commission. For example, government authorities in the USA, Canada and Germany conduct organisational panel surveys. Direct or indirect governmental funding plays an important role for the duration of longitudinal surveys, because they are a quite expensive research instrument (see Scherer, 1980, p. 60) due to the

Background:

- Governmental statistics
- University research
- Labour market NGOs
- Commercial research
- Commercial research

necessity of personal interviews for data collecting and a huge number of cases. Legal answering obligations are also a special characteristic which can be found in governmental research. They usually cause a higher response rate, but there may be a bias towards a special kind of 'social desirability', let's call it legal desirability, whose effects cannot be estimated or even controlled easily.

University research is another kind of background to organisational surveys. They sometimes have a kind of pilot function in methodological respect or are strongly focussed on one special item, which is closely related to scientific debates, and can therefore be very elaborate and detailed, while governmental surveys often do have to serve many purposes at the same time. Despite some exceptions, the funding of the university type of surveys is restricted by the duration terms of research programmes, which are normally not too long. This explains the observation that panel surveys of a university background are usually ceased after some years. None of which we know existed for longer than ten years.

Like many individual or household panels, some establishment surveys do even have a kind of commercial background. Usually they serve as a source of information for other businesses in search for customers and suppliers. Beyond some basic informations their scientific content is quite low as the 'Fortune 1000' example shows.

A high temporal stability cannot only be reached by surveys of the 'pure' governmental type. There are some surveys which show a mixed background. A good example is the German 'Mannheimer Innovationspanel', which is funded by the state government of Baden-Württemberg, employers' federations and the University of Mannheim. Maybe the strong corporatist aspects of German economical and labour policy (Thelen, 1991; Keller, 1997) make a good background for mixed funding, somewhat between governmental authorities, universities and mighty stakeholders' federations, because there are at least two other examples for this mixed type of funding in Germany. The United Kingdom is not so much under suspicion for having a very corporatist structure of labour policy (Windolf, 1983), but the Workplace Employee Relations Survey (WERS) is also co-funded by government, unions and employers federations. This special background for organisational panel surveys may derive from the well-developed tradition of empirical research on industrial relations in Great Britain. Collective agreements in the UK differ very much from sector to sector. Some sectors have centralised but most of them have very decentralised structures of collective bargaining and a lot of negotiations and agreements take place in establishments or enterprises. This leads towards two consequences: Decentrality and intricateness of the industrial relations system produce high needs of stakeholders for empirical research and thus to sufficient funding activities. And, the enterprise or establishment is the typical unit for industrial relations research, which gives a good background for micro-level research in the whole. It is interesting, that some of the oldest and still existing European organisational panel surveys have a mixed funding and responsibilities background, which seems to give them durability not only in financial respects, but also for a long-lasting and durable institutional embeddedness, where strong and close ties to more than one stakeholder may play an important role.

Benchmarking inventory of ICT-related organisational surveys

This section deals with ICTs in enterprises or workplaces as embedded in a context of innovation and changing labour market outcomes. The main objective of this report is assessing and benchmarking organisational surveys that monitor these issues. A similar benchmarking study has been undertaken by Rik Huys, Geert Van Hootegem and Luc Sels earlier. This report has been published under the title *Measuring the degree of Organisational Transformation*. The latter, however, focused on surveys dedicated to new organisation concepts, while the present aim is to investigate ICT-related surveys. Nevertheless, with regard to methodological benchmarking of organisation surveys, there has been considerable input from this earlier work.

Things are definitely moving in this field of study, and in several ways transformation is supported and encouraged by policy and policy-makers at diverse political and semi-political bodies. The European Commission is adopting a lively interest and an active role in ongoing activities, as we have witnessed the establishment of the European Work Organisation Network and the publishing of the green paper entitled 'Partnership for a new labour organisation' (European Commission, 1997). The present research project is yet another indication of this commitment. The *OECD* is also playing a leading role in this respect. The action points are the following "(1) fostering the adoption of 'innovative workplaces' by individual companies; (2) reforming framework conditions to maximise the incentives to introduce new forms of work organisation and to minimise the obstacles; (3) enhancing the development of human capital" (OECD, 1998).

The conviction that ICTs are a not to be neglected factor in this transformation story has accordingly gained ground, and so has the urge to investigate this issue by means of surveys. Often, there seems to be little disagreement that ICTs are rightfully on the policy and research agenda. Yet, this is not the case in all countries and all over the world, and even in countries where this is the case one can easily detect blind spots and essential questions that still lack convincing answers. It may even be doubted whether sufficient, valid reliable and comparable data are available on the dissemination of ICTs, even in OECD countries.

Secondly, the conviction that the introduction of new technologies can have an important impact on the labour market dates from the first technological revolution. The controversy on employment or labour market effects emerged at the same time. Since then every technological innovation seems to have opened similar discussions over and over again, as is the case in our present era of new information technologies. Thus, the question needs to be readdressed in the present context.

A third question relates to the relation between innovation and ICTs, and again the discussion remains somewhat unsettled. Additionally, the relationship with organisational performance needs to be considered. Obviously, it makes sense to assume that technology can be of great help in improving organisational performance. Nevertheless, from a scientific and policy-making point of view this argument needs to be validated, or better, stand the test of scientific falsification. If this is the case, it is of even more importance to figure out how improvement has come about. Again there is a lot of empirical work to be done to settle the matter.

A further example of blind spots refers to international diversity, that should be discernable if comparable data are available. It is plausible that 'some differentiated spatial development' is

taking place as was suggested by Van Hootehem (2000) in the context of new organisation concepts.

The importance of these questions justifies the further development and perhaps even more the convergence between existing organisation surveys. In order to be able to respond to the above questions, ideally these surveys should satisfy a number of characteristics. For instance, the performance question implies that it should be possible to demonstrate that new information technologies always lead to improved performance, regardless of differences in market characteristics. Such causal questioning makes panel studies necessary. The question about the international diversity again underlines the importance of greater alignment between organisation surveys currently operating at national level. In response to the question about the dissemination of ICTs, we must again look for ways of defining the population of organisation surveys as broadly as possible and bringing the sample frame in line with this ambition.

A total of thirty major organisation surveys are involved in this comparative study. A comparative study of surveys can be carried out at various levels. An initial approach is to compare results. A second comparison level is that of the conceptual frameworks and modes of operationalisation used. A third level is that of the survey methodology or *survey design*. This section concentrates mainly on this third level, in other words on a comparison and evaluation of the methodological choices in these thirty surveys. However, with regard to the implementation of ICTs a concluding paragraph looks into the elaboration of concepts used and themes tackled in the questionnaire. The objectives can be described as follows:

- comparison of organisation surveys with the aim of making an inventory of 'good practices' at several levels (e.g. sampling method, non-response strategy, etc.), which can strengthen the quality of research;
- charting current 'methodological diversity' with the aim of investigating the possibilities for cross-national research;
- reviewing ICT-related themes or questions in the scrutinised surveys, as well as links to performance, labour market and innovation.

We chose this approach because little information is currently available about the methodological limitations of organisation surveys, the results of which appear frequently in journals and policy circles. By contrast, the findings relating to the content of these surveys have frequently been put under the microscope (Appelbaum & Batt, 1995; Cappelli, Bassi & Katz, 1997; European Commission, 1999; Kling, 1995; Marsden, 1995; OECD, 1999; Vickery & Wurzburg, 1998). These comparisons of content are, incidentally, fraught with major difficulties precisely because the choices of methodology differ widely. For this reason, focusing on the methodological approach of the surveys and explaining the differences between them produces a stronger foundation for such comparisons at results level.

Now we will proceed as follows. After discussing the selection criteria of the thirty surveys studied (paragraph 1), we will go into systematically comparing these surveys based on the following dimensions: *Description of the population (paragraph 2)*, *definition of research units (paragraph 3)*, *sampling plan and sampling (paragraph 4)*, *choice of respondents (paragraph 5)*, *questioning method and response behaviour (paragraph 6)* and *continuity of the survey efforts (paragraph 7)*. Next, the questions related to the implementation of ICTs are discussed, as well as links to labour market, performance and innovation (paragraph 8).

1. Inclusion criteria

In this first paragraph, we explain the selection of the thirty organisation surveys involved in this comparative methodological research. Three inclusion criteria were used. As far as the *content* is concerned, the surveys selected are those which are devoted to examining the implementation of ICTs and/or organisational concepts and preferable are able to relate these to the internal and external labour market of the organisation as well as to its performance.

As far as *scope* is concerned, the inventory is targeted firstly at 'broad' surveys. This means that the inventory is confined, in the first instance, to restricted and unrestricted diverse and multiple-sector surveys.

Table 2.1 Summary of the ICT-related surveys discussed

	Survey	Organisation	Country
<u>AICD</u>	Inventories and Application of Information and Communication Devices	Central Statistical Office	Hungary
<u>COI</u>	Changements Organisationnels et l'informatisation dans l'Industrie (Organisational Changes and Automation in Industry)	SESSI (Ministère de l'économie, des finances et de l'industrie, Service des Statistiques Industrielles) and DARES (Ministère de l'emploi et de la solidarité, Direction de l'Animation de la Recherche des Etudes et des Statistiques)	France
<u>e-Envoy</u>	eEnabling the voluntary and community sectors	Office of the e-Envoy	UK
<u>Eurostat</u>	eCommerce and ICT usage by European enterprises	Eurostat plus 13 national statistical institutes	Europe
<u>ISI</u>	Neue Produktionskonzepte in Deutschland (New Production Concepts in Germany)	Fraunhofer-Institut für Systemtechnik und Innovationsforschung, Abteilung Innovationen in der Produktion	Germany
<u>NIFA-panel</u>	Neue Informationstechnologien und Flexible Arbeitssysteme	University of Bochum	Germany
<u>NOS</u>	National Organisation Study	University of North Carolina, Department of Sociology	USA
<u>NUTEK</u>	Flexible Work Organisations	Swedish National Board for Industrial and Technical Development, Department of Industrial Policy Analysis	
<u>Observatory</u>	A Research study into the use and application of Information Technology in Greater Nottingham by the Observatory	The Observatory	UK
<u>Rutnet</u>	Rutland Business ICT Awareness & Skill Levels Survey	Quality fieldwork and research services	UK
<u>SOWING</u>	Information Society, Work and the Generation of New Forms of Social Exclusion	WRC (FI), ITAS (DE), FORBA (AT), IES (UK), HIVA (BE), IRES (IT), FCT-UNL (PT), NEXUS (IE)	Europe
<u>STV-TS</u>	STV - technologie-enquête	Stichting Technologie Vlaanderen (STV)	Belgium

Table 2.2 Summary of the non- or less ICT-related surveys

	Survey	Organisation	Country
AWIRS	Australian Workplace Industrial Relations Survey	Australian National University, Canberra	Australia
DISKO	Danish Innovation System in a Comparative Perspective	Aalborg University, Department for Business Studies	Nordic countries
Emergence	Estimation and Mapping of Employment Relocation in a Global Economy in a New Communications Environment	Institute for Employment Studies, UK (IES, leading partner)	Global
EPOC	Employee direct Participation in Organisational Change	European Foundation for the Improvement of Living and Working Conditions	Ireland
Fortune 1000	Survey of Employee Involvement and Total Quality efforts in Fortune 1000 companies	University of Southern California, Marshall School of Business	US
Hannover	Hannover Firmenpanel	University of Hannover, Faculty of Economics, Research unit 'Firmenpanel'	Hannover
IAB	Institut für Arbeits- und Berufsforschung (Institute of Industrial and Career Research)	Institut für Arbeitsmarkt- und Berufsforschung der Bundesanstalt für Arbeit, Arbeitsbereich 5: Betriebliche Arbeitsnachfrage- und Innovationsforschung	Germany
LRD	US Longitudinal Research database	Center for Economic Studies – US Bureau of Census	LRD
MITI-MOL	MITI-MOL Survey	Japanese Ministry of Industry and Trade (MITI), Ministry of Labor (MOL)	Japan
NES	National Employer Survey/Educational quality of the workforce	Bureau of the Census/United States Department of Education/University of Pennsylvania, National Center on the Educational quality of the workforce	US
OSA	Organisatie voor Strategisch Arbeidsmarktonderzoek (Organisation for Strategic Labour Market Research)	Katholieke Universiteit Brabant, Instituut voor sociaal-wetenschappelijk beleidsonderzoek en advies	The Netherlands
PASO	Panel survey of organisations	HIVA	Belgium
R&D panel	Japanese Research & Development panel	Census Office MITI	Japan
STV	Innoveren: meer dan technologie alleen	Stichting Technologie Vlaanderen (STV)	Belgium
WERS	Workplace Employee Relations Survey	Department of Trade and Industry, Department: Employment Relations, Employment Market Analysis and Research	UK
WES	Workplace and Employee Survey	Statistics Canada, Business and Labour Market Analysis Division	Canada
WSI	Betriebs- und Personalrätebefragung	WSI – Institute of Social and Economic Research of the Hans-Böckler-Foundation	Germany
ZEW	Mannheimer Innovationspanel	Zentrum für Europäische Wirtschaftsforschung (ZEW)	Germany

In terms of *continuity*, the surveys included are those which regularly measure changes in organisations. This includes both surveys which aim to provide periodic (for example, biennial) cross-sectional measurements as well as panel studies that allow to study trends at organisational level and not merely at the level of the population as a whole.

The inventory was expanded to include a few surveys that do not meet the 'continuity' criteria. These are surveys which are particularly interesting at methodological level, for example because of the way in which the sample frame is constructed, because of the sampling method used, etc. We include these surveys because they can have an inspirational effect on future attempts to streamline methodological diversity in some way.

In Table 2.1 and 2.2, the thirty surveys are presented which were selected on this basis. An abbreviation is given for each survey, which will be used further in this paper. Table 2.1 sets out the thirteen surveys giving substantial attention to the implementation and use of ICTs. Table 2.2 displays the surveys primarily focussed on organisation concepts. In addition the organisation responsible for the survey and the country or region the results relate to are indicated. In the appendix, more identification data are presented on each survey, allowing the interested reader to trace the survey concerned. It goes without saying that the inventory is not complete. Many other organisation surveys were identified, but partly as a result of the unavailability of English, German or French publications, it was not possible to obtain sufficient information within the time available. As such the inventory made has of course an ongoing character, like all research results.

The thirty selected surveys are compared to one another in seven consecutive stages. The order of the stages is as follows: description of the population, definition of research units, description of the sampling plan and sampling, choice of respondents, questioning method and response, periodicity or continuity, and, finally, ICT-related themes and questions.

2. Description of the population

One initial question related to the establishment of an organisation survey is the description of the population. The population is the well-defined empirical field of validity for which the statements made on the basis of the survey will apply. Describing the population is important, given that population limits also determine to what extent statistical generalisations will apply. In the second stage, a sample is taken from this population, although this is not always the case. For instance, in the *e-Envoy*, the empirical field of validity was described in such a restrictive way that it was possible to involve all units of its population in the survey research.

The surveys listed in Table 2.1 and 2.2 are all broad in scope, except perhaps the NIFA-panel and *e-Envoy* (engineering industry and voluntary and community sector). The latter two surveys might be classified as single-type organisation surveys. Nonetheless, the population rarely covers all organisations active within a national economy. Based on their population description, most of the surveys can therefore be described as *restricted* surveys. This is evident from the following summary, in which we illustrate how the surveys deal with the two most frequently used inclusion criteria - the number of employees and the activity of the organisation.

A population limit that occurs frequently is the limit by size of the research units, although several exceptions are included (Table 2.3). The restriction can take place based on turnover (e.g. Fortune 1000 Companies). Usually, however, a limit is defined based on the number of employees. Obviously, financial considerations play an important part in this decision. The cost to question a small organisation is almost similar to that of questioning a large organisation. However, questioning a large organisation covers a larger proportion of jobs. Confinement to larger organisations therefore makes it possible to chart a large proportion of jobs based on research into a relatively small number of organisations. A second argument is the unavailability of a database which also includes (qualitatively adequate, reliable information about) small organisations. Thirdly, operationalisation problems are also quoted. In this context, it is pointed out that variables related to organisation structures, teamwork, industrial relations, etc., are more difficult to uncover in small organisations, due to a lack of formal and sufficiently stable structures and forms of work (Neumark & Cappelli, 1999). Finally, it is often more difficult to identify a respondent in small organisations. In most surveys, the questionnaires are ad-

dressed to the head of personnel. In small organisations, this kind of separate job title is often missing.

Table 2.3 Population restrictions used. Limits based on number of employees and activity

	Minimum number of employees	Type of activity
<i>e-Envoy</i>	1	Voluntary and community sector
<i>Observatory</i>	1	Only private sector?
<i>NOS</i>	1	Whole economy (including self-employed)
<i>SOWING</i>	1	Whole economy
<i>Rutnet</i>	1	Whole economy
IAB	1	Whole economy
LRD	1	Only manufacturing industry
PASO	1	Whole economy
WES	1	Whole economy (excluding mining, government administration)
ZEW	1	Manufacturing and servicing
MITI-MOL	1	Firms being publicly traded
Hannover	5	Only manufacturing industry
OSA	5	Whole economy
<i>Eurostat</i>	10; except Germany and Spain: 1; and Denmark, Finland, Italy and the Netherlands: 5	Whole economy, except Germany: only retail and wholesale trade, restaurant and catering services
<i>STV-TS</i>	10	Whole economy
STV	10	Only industrial organisations
WERS	10	Whole economy (excluding farming, mining)
<i>AICD</i>	19	Whole economy
<i>COI</i>	20	Industry
<i>ISI</i>	20	Only investment goods industry
<i>NIFA-panel</i>	20	Engineering industry, except crafts sector
AWIRS	20	Whole economy
DISKO	20 (industry) / 10 (services)	Only private sector (excluding farming)
NES	20	Only private sector
WSI	20	Whole economy
EPOC	25 (small countries) / 50 (large countries)	Whole economy
Emergence	50	Whole economy
<i>NUTEK</i>	50 (target for 1999: 5)	Whole economy (excluding public administration, education, health care)
R&D panel	50	Only manufacturing
Fortune 1000	Fortune 1000 companies	Whole economy

Therefore, confining the research population to larger organisations produces a good 'input/output'-ratio. Statements can be made about a large proportion of jobs at minimal cost. However, this limitation can have a serious influence on the score for many variables and thus misrepresent the observation of trends in organisation concepts or ICT application. Smaller organisations, for example, are much less departmentalised than large organisations, but can also demonstrate a higher level of centralisation (Kalleberg et al., 1996). If they are excluded, descriptive statistics then give a distorted picture about the occurrence of such features in trade and industry. Moreover, by excluding small organisations, much of the dynamism in the economy is overlooked. In this category, many organisations 'enter' and 'exit'. Many rapid-growers are also found among the smaller organisations. If the survey is restricted to large organisations, these smaller ones will only come into the picture at a more mature stage in

their life cycle. In panel studies, in particular, this type of limitation has major consequences. The panel nature allows dynamics at micro-level to be better analysed. However, when only larger organisations are targeted, successful growers are not monitored from their birth, which means that the precedents for dynamic growth cannot be examined. It is then more difficult to identify predictive indicators for high performance. An additional problem with panels is the higher drop out between successive rounds. Those organisations close to the inclusion threshold in the first round (e.g. 21 employees when the threshold is a minimum of 20 employees) run a high risk of falling just below this threshold and, therefore, out of the population in the next round of questioning. Drop out will therefore be lower in panels without strict inclusion criteria, assuming all other conditions remain the same.

A second, frequently used inclusion criterion (also recorded in Table 2.3) concerns the *type of activity*. The exclusion most frequently used relates to (sections of) the services or public sector. The reason can partially be found in the difficulty of achieving generic operationalisation from the research variables. This is also related to the topics dealt with. Questions about the inflow and outflow of employees, their contract types, working hours, etc., are more generic in nature than questions about the level of automation, for example.

Thirdly, the identification of research units is often more difficult in the services and public sector. Production companies are often geographically concentrated around a physical production process at an identifiable address. Service-providers are often 'concealed' in various locations and are more difficult to demarcate organisationally.

Considering the ICT-related surveys (displayed in the tables in italics and underlined), six surveys (Observatory, NOS, SOWING, Rutnet, Eurostat, STV-TS) are specifically broad in scope. These surveys include relatively small organisations and large parts of the economy. In comparison with the R&D-panel for example, these surveys permit generalises that cover all sorts of economic activity.

In this respect, it is striking that not much organisation surveys target exclusively at the services sectors and none at the public sector, while the reverse - confinement to industry or the private sector - is more often the rule. One the one hand this might be surprising given that services and the public sector absorb a larger proportion of jobs in many countries and are responsible for the growth in employment. But on the other hand, the private sector, especially the manufacturing industry, is regarded as the 'true hart' of an economy, holding a key role for its stability, prosperity and development in the whole. "It all starts here" - thus reads the headline of the American Survey of Manufacturers webpage (ASM, 2002).

3. Research unit and sampling framework

Once the population has been defined, the question arises how to define the research units about which information has to be obtained. The aim of an organisation survey is, of course, to chart the reality in organisations. But at what level of the organisation is questioning to be carried out? Are we talking about head offices, companies, workplaces or units? One closely related question is that of the most appropriate sample frame. Table 2.4 shows the description of the research units as well as the data source used to establish the sample frame.

Ideal research unit. Generally speaking, research units must be defined which are as homogeneous as possible in terms of the questions used in the survey. The ideal level can thus vary, depending on the topics central to the research. For instance, in a discussion of the WERS results, Marginson (1998) emphasises that, for studying industrial relations, the company or wider organisational settings are often more suitable as research units. However, most surveys choose to use the workplace as the ideal research unit. In this context, the terms used include '*arbeidsorganisatie*' (labour organisation), 'establishment', 'workplace', '*Betriebseinheit*' (operating centre), '*Dienststelle*' (office). These terms all refer to a geographical entity. The emphasis is then on the geographical concentration of the (core) activities of the organisation.

Table 2.4 Sources for population/identification of research units

Survey	Research unit	Source for population/identification of research units
EPOC	Company	N/A (administrative data)
Fortune 1000	Company	Fortune
<u>AICD</u>	Workplace	Register of economic organisations
<u>COI</u>	Workplace	N/A (administrative data)
<u>Eurostat</u>	Workplace	National data files
<u>ISI</u>	Workplace	ISI address list based on previous questioning, Projektträger Fertigungstechnik und Qualitätssicherung (PFT) addresses, ABC industry databank / Arbeitgeberverband Gesamtmetall, Verband Bayerischen Metall- und Elektroindustrie (VBM), NC-Gesellschaft
<u>NIFA-panel</u>	Workplace	IAB / BA
<u>NUTEK</u>	Workplace	Central register of enterprises and local workplaces: Statistics Sweden
<u>Observatory</u>	Workplace	Business link Greater Nottingham database
<u>STV-TS</u>	Workplace	Decentralised statistics of the social security register
AWIRS	Workplace	****
Emergence	Workplace	Business directories of Dun and Bradstreet or Compass Direct supplemented with civil service directories or other lists of public organisations
Hannover	Workplace	Arbeitsstätten-Master-Sample
IAB	Workplace	Employment statistics register of the Federal Employment Services
LRD	Workplace	Census of manufacturers, Annual survey of manufacturers
MITI-MOL	Workplace	MITI register
NES	Workplace	Standard Statistical Establishment List (SSEL) file Bureau of the Census
OSA	Workplace	Chamber of Commerce, Bodies register of the Algemeen Burgerlijk Pensioenfonds, ASO list of schools (Ministry of Education), State directory (national government, provinces, water boards and municipalities), VWS address list (for hospitals, old people's homes and nursing homes), Since the last survey data source is Lisa, a register for both public and private sectors
PASO	Workplace	Decentralised statistics of the social security register
STV	Workplace	Decentralised statistics of the social security register
WERS	Workplace	Office for National Statistics: Interdepartmental Business Register
WES	Workplace	Business Register Statistics Canada
<u>NOS</u>	Organisation	Respondents in General Social Survey
<u>e-Envoy</u>	Organisation	Yellow pages, snow ball
<u>Rutnet</u>	Organisations and workplaces	*****
<u>SOWING</u>	Organisations	Administrative data from the national bank (Bel-first)
ZEW	Organisations	Verband der Vereine für Creditreform, this is a business register for the trustworthiness of enterprises
R&D panel	Organisations	Census register
WSI	Work or staff councils	Several business-, firm- and organisation registers open to public access
DISKO	N/A	N/A

A number of descriptions can explain this:

“A workplace is the activities of a single employer at a single set of premises.” (WERS)

“A workplace is a geographical location where a company runs a persisting activity. A company has at least one workplace. If the company has several buildings clustered together closely (e.g. in a fenced area), this is considered as one workplace.” (NUTEK)

“The establishment is the local unit which in fact performs the activities of a company, i.e. the manufacture of products or the provision of services.” (IAB)

Only a limited number of surveys concentrate - at least for part of the questionnaire - on part of the research unit. In this case, the questions only relate to the core process of the organisation or the key employees (EPOC). Other surveys make a distinction in the questions between different categories of employees in the organisation. Nonetheless, such differentiation is often very concise, in order to keep the questionnaire short. The emphasis in the analysis is therefore on the differences between organisations and – insufficiently - on the differences within organisations. Marginson thus notes (1998, p. 377): “Interestingly, given debates about workforce segmentation, there has been little analysis of within-unit differences across the non-manual divide or as between bargaining or occupational groups”. One possible way of compensating for this is to supplement organisation questioning with the questioning of a number of employees within these organisations (see below).

Suitability and completeness of sample frames. Most surveys have a big problem with the correct identification of the workplace. Research teams rarely have databases at their disposal with workplaces as units. The quality of the databases available, however, determines the quality of the *sample frame*. Sample frame refers to an existing register of all the basic units which together make up the population. This framework is the source for sampling. The reliability of generalisations based on a sample therefore depend on the accuracy and completeness of this sample frame. Deviations between population and sample frame are permissible, provided they are known and therefore correctable. Most of the research institutes executing organisation surveys, however, provide little information about the differences between sample frame and target population.

The critical problem is that a correct sample frame from which a sample of workplaces can be extracted is rare. Some organisation surveys therefore choose (often tacitly) different research units which are listed in administrative databases. Moreover, the description of the units in the above databases is linked to the specific administrative guidelines in the various countries and is, as a result, not very transparent. The description of units is therefore under-reported by most surveys. Particularly when comparing the results of similar surveys, this poses a major problem.

Several surveys claim that they have no problem finding a suitable sample frame at workplace level. Other surveys compile their universe from various databases (OSA, IAB, ISI, NIFA, WSI, Emergence). Owing to the lack of reliable databases at workplace level, the precise demarcation of the research units in many surveys is, however, one important task of the interviewer (WES, IAB). The IAB questionnaire provides the interviewers with an extensive set of guidelines which should allow them to check whether they are approaching the correct research unit. This is one important advantage of face-to-face questioning. Since information gathering takes place on the spot, more adequate supervision can also be carried out regarding the demarcation of units. This leads to more reliable data collection.

It is important, particularly in organisation panels, to keep the research units as small as possible. In order to make longitudinal analysis possible at micro-level, as many organisations as possible must be included in successive rounds. Panels have to cope, however, not only with drop out between rounds, but also with research units which have changed dramatically (i.e. as a result of mergers, contracting out). For instance, in the OSA panel, the number of fundamentally different units over two years is estimated at 9%, which means that only 91% of the organisations which actually respond in the second round can be regarded as genuine ‘panel organisations’. The greater the scope of the research units (e.g. companies rather than workplaces), the greater the likelihood that these units will change fundamentally and therefore leave fewer panel organisations.

The NOS offers an original approach to the problematic identification of research units. In identifying research units, this survey is not based on administrative lists, but on a representa-

tive sample of employees. The employees selected are asked in which organisation they are employed. The organisations traced in this way form the final sample. This 'individual-based' approach circumvents the difficulty or impossibility of putting together a sample frame of organisations and can use existing methods to draw a representative sample of employees. Moreover, this individual-based approach is ideally suited to compile a sample where the chance of selecting an organisation is proportionate to its size (PPS sample or Probability Proportionate to Size; Sudman, 1976), as is often usual in organisation surveys. A selection of organisations by questioning a representative sample of working people produces a PPS sample of organisations. The chance of selecting an organisation is indeed proportionate to the number of employees in that organisation. The degree of cover provided by this sampling method is also ideal. After all, no single organisation is excluded, while organisations always have to meet a number of criteria to be included in databases. If organisations are questioned soon after employee questioning, the information is also up to date. This method is also suitable if the intention is to link the questioning of organisations to questioning employees in this organisation. After all, in the first stage of such sampling, employees are approached who could at the same time be questioned about their work situation.

The advantage of a PPS sample of organisations can, however, also be an obstacle if a PPS sample of organisations is explicitly not required and a stratified sample is intended, which includes other criteria (sector or region). One additional problem is posed by the potential difference between the place of residence and place of work of employees. A random sample of the working population based on place of residence produces a number of people who work outside the territory of the organisation survey. Other major problem with the PPS approach is the cumulative drop out at both stages of the sampling, or the lack of awareness of questioned workers in large organisations with decentralised structures, to which sub-organisation they belong. In order to compile a sample of organisations, people are first approached (some of whom are non-responses), some of whom will not or cannot answer the question about the organisation they work for (additional item non-response) or for whom the data prove to be inadequate. Once the sample of organisations has been compiled, an additional non-response also occurs at this level, so that the cumulative non-response from organisations is considerably higher than if a sample of organisations had been taken directly.

4. Sampling plan and sampling

Once the sample frame has been defined (and its suitability and completeness examined), a sampling plan has to be drawn up. The sampling plans for the organisation surveys differ from one another chiefly at the level of (1) the method of stratification and (2) whether or not they have a two-stage sample.

Stratification. Not one survey goes for an entirely simple random sample. This type of sampling plan would mean that organisations with many employees are hardly ever included in the sample. The sample of organisations is then representative but, given that the population of organisations includes primarily a large number of small organisations, the final sample will cover a particularly small proportion of jobs. For this reason, the sample is stratified in virtually all surveys. The mentioned PPS-alternative of the NOS is an exception to this rule. e-Envoy started out with a simple random sample, but subsequently corrected for underrepresentation of larger organisations, which is not the same as a stratified sample.

In the stratification, the size of the organisation (in terms of the number of employees) is always taken into account. One alternative is to combine a sample from small organisations with a census of large organisations (for example, all organisations with more than one hundred employees are questioned). Most surveys add additional variables to the stratification model, such as the activity of the organisation and/or the region where it is based. This should enable reliable pronouncements to be made at the level of the regions, for example, including for regions where a random sample would not provide sufficient observations. The following table presents a summary.

Table 2.5 Information about sampling plan

	Stratification variables (number of classes)	Two-stage sample
<i>ISI</i>	No stratification (census)	
<i>NIFA-panel</i>	No stratification (census)	
<i>NOS</i>	No stratification (PPS sampling technique)	Two-stage sample 'in reverse'. Based on information from employees, organisations are questioned
<i>Observatory</i>	No stratification (census)	
<i>e-Envoy</i>	Random sample corrected for any over or underrepresentation in sizes	
<i>Rutnet</i>	No stratification (census by region)	
<i>AICD</i>	Activity (branches A through O, excluding L according to TEAOR are surveyed), size (unknown number)	
Fortune 1000	No stratification (census)	
Hannover	Activity (unknown number) and size (unknown number)	
<i>STV-TS</i>	Activity (48) and size (5)	
IAB	Activity (16) and size (10)	
OSA	Activity (9) and size (5)	
STV	Activity (5) and size (4)	
WERS	Activity (12) and size (6)	
AWIRS	Fixed number of 250 observations in category 10-24 employees	
WSI	Size (unknown number)	Random sample of 25 employees per workplace (if fewer than 25 employees, all employees are questioned)
<i>Eurostat</i>	Size (unknown number)	
<i>SOWING</i>	Activity (19 subsections), region (13 countries) and size, sample frames may differ depending on national statistical offices	
<i>NUTEK</i>	Activity (NACE seven strata, 1 digit), region (8) and size (20-49/50+)	
EPOC	Activity (5), region (3) and size (6)	
Emergence	Activity, region (10 countries) and size (unknown number)	
WES	Activity (4), region (18 countries) and size (2)	
PASO	Activity (14), region (6) and size (variable number of categories depending on spread in the activity/combination)	Random sample of 6 employees per workplace (if fewer than 6 employees, all employees are questioned)
ZEW	Activity (11), region (6) and size (7)	
LRD	Size (9) and sector (50). Random sample of 30,000, then stratified and condensed to 12,000. Condensation to the point where every cell in 9x50 cross-tabulation of size and sector will show the required number of cases	
<i>COI</i>	Total sampling for the database, different smaller samples used for special surveys	
DISKO	Not available	Employees' sample is not compiled via the organisation, but directly
MITI-MOL	Not available	
R&D-panel	Not available	
NES	Not available (over-representation of large workplaces and manufacturing establishments)	Objective for 2000: additional sample of employees per workplace

Based on a combination of the stratification variables, a sampling table can be compiled, showing a minimum number of observations for all cells. In some surveys, this minimum number of observations is corrected for the expected rate of non-response. Achieving the sampling plan is, however, difficult in most surveys because the non-response is not the same in all cells. Even if non-response units are replaced in each cell, the sample achieved usually differs from the sampling plan. This deviation can be attributed to mistakes in the sample frame or to the time lag between registration in the sample frame and the time of questioning. The longer this time lag, the greater the likelihood that research units will shift to another cell in the sampling table (e.g. because of growth or a reduction in numbers of employees). This once again emphasises the importance of recent, accurate and complete sample frames.

Two-stage sample. Table 2.5 shows that five surveys use a two-stage sample. In this case, the sampling of organisations is followed by a sampling of employees in those organisations. Organisations are questioned in combination with a questioning of employees. Consequently, characteristics at the two levels can be linked to one another. A two-stage sample allows the perspectives of various stakeholders to be taken into account. The importance of two-stage sampling is illustrated as follows by Greenan and Mairesse (1999, p. 12; COI): "Firm representatives generally describe formal organisation, whereas workers can be asked about what they really do and how they adapt assignments to the context of their work. Topics like empowerment, worker involvement and greater autonomy on the shop-floor cannot only be investigated through what management knows about it. It is even more true for considerations about intensification of effort, stress or all types of adjustment costs caused by organisational change." The WERS also records striking differences in the answers from managers and employee representatives concerning the level of collective action within the organisation (Marginson, 1998). With regard to the ICT surveys, only COI employs a two stage sampling method.

Nonetheless, we note the increasing popularity of combined organisation and employee questioning. Inspired by the success of its Australian counterpart the AWIRS (Morehead et al., 1997), the WERS switched to an additional employee questioning for its most recent measurement. From 2000 onwards, the NES is carrying out an additional employee questioning in the organisations. The IAB is right now successfully finishing the testing period of its 'linked employer-employee-database', where organisational panel data are combined with employee register data from the social security bodies, thus being able to monitor the whole staff of each questioned establishment. The problem is a two-years time-lag due to collecting, selecting and preparing establishment-specific employee data out of the social security registers.

In most surveys working with two-stage samples, a fixed number of employees is randomly selected from personnel lists made available by the organisations, regardless of the size of the staff (see Table 2.5). COI is an exception to this rule. In this survey, the employees are approached directly, separately from the organisation. The organisation is however informed of this approach, but without an identification of the people questioned.

5. Respondent(s)

Once the research unit has been established, the question arises which functions are best suited as a respondent. The answer depends partly on the research topics. If the emphasis is on topics such as automation, production or work organisation, it is more appropriate to question line management. However, if the emphasis is on personnel data, personnel policy or industrial relations, it is better then to approach the head of personnel. Interested as we are in ICTs, we could try to identify an IT manager within the research unit, as is specified in Eurostat, or the 'technical manager' as is done in STV-TS. The correct selection of respondents is important to the collection of reliable data. All too often, the head of personnel is approached with questions on topics about which (s)he is insufficiently involved. Osterman (1994, p. 174) says, in this respect, "Years of open-ended interviews with firms suggested to me that too often HRM staff, even at the establishment level, are not in touch with work organisation".

A detailed description of the respondent is not established in advance in many organisation surveys. After all, interviewers often do not have the name and position of potential respondents. Many surveys are therefore confined to vague descriptions along the lines of "a representative from the workplace" (Fortune 1000, NES). Face-to-face interviewing has the advan-

tage, in this context, that the interviewer can determine on the spot who is the most suitable respondent. Most questionnaires explicitly ask about the position of the respondent, so that any distortion produced by this variable can be controlled.

Some surveys explicitly provide the possibility (or obligation) of talking to several respondents (AICD, COI, NES, OSA, WES). For instance, the AICD uses at least two different questionnaires per research unit, one of which is intended for the production manager and one for the personnel manager. The WES questionnaire is modularly built so that the most appropriate person in the establishment can answer. This can reduce the load on respondents and improve the quality of the answers. However, the risk involved in this strategy is that questionnaires remain incomplete (non-response from one of the respondents). With face-to-face interviewing, the use of several respondents does also lead to higher costs. For this reason, this method was abandoned in the WERS. OSA offers an original solution to this, by using different questioning methods for different sections of the questionnaire. Face-to-face interviewing is supplemented by a written questionnaire, which asks for a number of 'hard facts'. This written questionnaire is subsequently collected by the interviewer on the spot.

It is necessary to talk to various respondents if various levels of the organisation are being questioned, such as in combined organisation/employee surveys. In this case, the respondent at the organisational level is not only questioned about content, but also acts as an informant for selecting respondents among the employees.

6. Questioning method and response behaviour

One of the crucial evaluation criteria by which organisation surveys are judged is the response ratio. A low response jeopardises representativeness. In a panel, a high non-response leads to an overly limited panel section for the dynamic analysis. Generally speaking, it can be said that the extent of the response depends partly on the chosen questioning method. For this reason, the questioning method is placed next to the response in Table 2.6. Some comments are necessary to interpret the table in a correct way.

An initial comment concerns the combination of questioning methods. Several questioning methods are applied in a number of surveys, not always with the same respondents. Face-to-face questioning can be supplemented, with the same respondent, by a written questionnaire which has to be sent by mail or which is collected by the interviewer (OSA). In two-stage samples, face-to-face questioning at organisation level can be combined with telephone (WES, COI) or written (WERS) questioning of employees.

Secondly, it should be noted that the difference between the three questioning methods (face-to-face, telephone and written) is not always clear. Written questioning is not necessarily a postal survey. The questionnaires can be delivered and/or collected by an interviewer on the spot. In this case, response ratios can be achieved which come close to those of face-to-face questioning. A telephone survey can be supplemented or backed up by a written questionnaire. The questionnaire can be given to the respondent in advance for use during the telephone interview, or it can be sent if the respondent requests a questionnaire on paper. For instance, the NOS carried out telephone questioning of organisations in which over 41% of respondents asked to have the questionnaire sent to them so that they could complete it in writing (although only 29% did actually complete the questionnaire). In face-to-face questioning, too, it is sometimes possible for the respondent himself to complete the questionnaire wholly or partially and then to give it to the interviewer (IAB). All these variations produce varying response ratios (see Table 2.6).

Table 2.6 Summary of questioning methods and response (in multi-stage sampling: ORG = establishment, company or organisation level; EMP = employee level)

	Questioning method (duration)	Sample size	Response (response ratio)
IAB (1993)	Face-to-face	N = 6,923	N = 4,356 (71%) about 85% in average (following years)
Hannover	Face-to-face	N = 2,800	N=1,064 (36%) Panel = 85% in 1994 and 1995; 98% in 1996
WERS	ORG: face-to-face (100') EMP REP: face-to-face (45') EMP: written	ORG: 2,694 Panel ORG: 1,030 EMP REP: 1,155 EMP: N = 44,120	ORG: 2,191 (80%) Panel ORG: 882 (85%) EMP REP: 947 (82%) EMP: 28,237 (64%)
<u>NOS</u>	Telephone	N = 1 127	N = 727 (64%)
<u>Rutnet</u>	Telephone	gross N = 842 net N = 751	N = 546 (72.7%)
<u>STV-TS</u>	Telephone	gross N = 2,464 net N = 1,732	N = 1,212
NES	Telephone (28')	N = 4,625 (1994)	N = 3,173 (69%)
Emergence	Telephone	N = 8,050	N = 7,305 (90.7%)
STV	Telephone	gross N = 1,197	N = 934 (78%)
<u>COI</u>	ORG: written EMP: telephone	ORG: N = N/A EMP: N = 9,000	ORG: N = N/A (88%) EMP: N = N/A (71%)
<u>AICD</u>	Written	N = 23,564	Responding is obligatory
<u>Eurostat</u>	Written	N = 100,000	N = 40,000 (40%)
<u>ISI ('97)</u>	Written	N = 10,193	N = 1,329 (13%)
<u>NIFA-panel</u>	Written	N = 6,000 (100% of population) Net N = 1,700 on average	N = 476 (28%) Panel: N = 250 (7%) through 8 waves
<u>NUTEK</u>	Written Aim 1999: telephone + written	N = 2,064 Aim 1999: 5,700	N = 707 (34%)
<u>Observatory</u>	Written	N = 2,000	N = 413 (20.65%)
<u>SOWING</u>	Written	Net N = 800	N = 224 (28%)
DISKO	Written	N = 3,958	N = 1,900 (48%)
EPOC	Written	N = 33,427	N = 5,786 (18%)
Fortune 1000	Written	N = 985 (1993)	N = 279 (28%)
WSI	Written	Gross: private sector: N = 51,544 (1997), N = 30,747 Public sector: N = 12,805 (1997), N = 2,914 (1999) Net: 2,956 (1997), 2,914 (1999), both sectors	Private sector: N = 272 (8.1%) (1997), N = 131 (4.5%) (1999) Public sector: N = 239 (8.1%) (1997), N = 347 (11.9%) (1999)
<u>e-Envoy</u>	Written + on line	Not available	N = 1,500
Paso	On line + written (size <5)	Not finalised	Not finalised
OSA (1997)	Face-to-face + written	N = 2,700	N = 2,700 N = 2,168 (written part) (85%) Panel 1995: N = 1,718 (63%)
WES	ORG: face-to-face + written EMP: telephone (25')	ORG: 1,311 EMP: 3,468 Aim 1999: 7,500 work-places and 40,000	ORG = 748 (57%) EMP = 1,960 (57%)
AWIRS	Not available	Not available	Not available

Table 2.6 Summary of questioning methods and response (in multi-stage sampling: ORG = establishment, company or organisation level; EMP = employee level). Continued

	Questioning method (duration)	Sample size	Response (response ratio)
LRD	Not available	10,000 SMY 2,000 R&D 16,000 establishments with 200,000 workers	Responding is obligatory
MITI-MOL	Not available	Gross N = 6,622 Net N = 1,206	18.20%
R&D	Not available	Not available	Not available
ZEW	Not available	Gross N = 30,000/ 12,000 (1991/1993) Net N = 2,200 manufac- turing industry, N = 2,200 services industry (2002)	Not available

Thirdly, we must note that several surveys provide very incomplete information about response. Even though a response ratio as such does not say everything. What about the item non-response? Was the response calculated with respect to the 'gross' or 'net' sample (this means after leaving out all observations which could not be identified or no longer exist)? Which sample was originally taken and what section of it was used, if replacements were used? If several questioning methods were used, several response ratios also have to be given. If two-stage sampling was used, a distinction has to be made between the non-response in the second stage and the non-response cumulatively with the non-response in the first stage. With panels, not only the response from a given round is important, but also and in particular the response from organisations which answered in a previous round. In this context, a distinction must be made between organisations which now no longer exist or now fall outside the sample frame, those which could not be found and those which did not respond. Only the last type of drop-out can genuinely be regarded as 'non-response'. To the extent that the surveys do make this distinction, Table 2.6 can be read as the ultimate response to a net sample. Where several respondents are present and in panels, several ratios are indicated in so far as available. Where the sample has several stages, only the response ratio within one stage was indicated.

In summarising the response ratios indicated, it is obvious that the questioning method does indeed correlate with the response ratio. Written questionnaires produce the lowest response if they are mere postal surveys (average approx. 25%: see Fortune, DISKO, NUTEK, ISI, EPOC), even if reminders are used or if the questionnaires are sent twice. COI is an exception to this rule.² Telephone questioning scores fairly well (average approx. 65%). It is also much cheaper than face-to-face questioning and therefore seems an attractive alternative. However, this questioning method places a limit on the duration of the interview. Telephone interviews have to be kept short (NES: 28'; WES: 25'; NOS: 41'). The leader as far as response is concerned is face-to-face questioning. The highest score is achieved by WERS (80% and 85% for the panel section). This is probably the most established survey, with a long tradition, which means that questioning can systematically be optimised. The WERS also has an extensive research group, pursues an active policy of making databases³ available for research and spares neither time nor money in training interviewers. On the other hand, none of the twelve ICT surveys use the most desirable questioning method, namely face-to-face questioning. NOS (64%), Rutnet (73%) and STV-TS (70%) perform well, making use of telephone interviewing. The remaining six ICT surveys make use of the written questioning method, yielding an average response rate of 27% (COI and AICD not included, since responding is obligatory).

² The written questioning method of COI yields a striking response ratio of 88%. This is explained by the fact that the questionnaire was accompanied by a letter of the ministry saying that participation is obligatory. In this context the 12% non-response is equally striking as the 88% response.

³ For a summary of over one hundred publications based on a secondary analysis of the WERS databases, see Millward et al. (1998).

Given the low response rates in many surveys, attention must be given to non-response analysis. Attempts can be made to correct non-response using a comparison of the characteristics of non-response organisations with characteristics of the response organisations or the population (for an excellent study of this problem, see Groves & Couper, 1998). Some surveys draw up non-response weighting factors on the basis of these comparisons, in particular to correct the deviation in the sample obtained with respect to the sampling plan. Other surveys dispense with this because it is possible to correct for a number of known organisation characteristics, but it is not clear to what extent the answers to the questionnaire actually correlate with these features. As an example, due to a very low response (13%) and having to work with a sample which differs considerably from the sampling plan, the ISI decides not to allocate weights based on a non-response analysis because "the influence of such weights on other variables depends on a multiplicity of other, non-controllable factors which can just as easily produce the reverse effect" (Lay, 1997, p. 5). There is then little alternative but clearly to explain the deviations in the sample compared to the intended sample and the population.

Some surveys make a differentiation in the response according to the characteristics of the organisations. This differentiation allows to concentrate efforts in subsequent measurements on the critical groups. It is striking that a link is seldom reported between the response and the size of the organisations. Small organisations do not respond noticeably less than large organisations. Some surveys refer instead to a U-shaped link. In small organisations, the manager (jack of all trades) has no time to answer the questionnaire. Large organisations have to battle with over-questioning. Consequently, the highest response comes from the middle category.

Finally, it should be stressed that two-stage samples report some success with respect to response rates. Employers do not seem hesitant when it comes to making personnel lists available or allowing employees to be interviewed, as long as employee questioning takes place outside working hours. Nonetheless, cumulative non-response at both stages of the sample continues to plague researchers.

7. Continuity

Although only a limited number of surveys consist wholly or partially of a panel, most are periodic in nature. This implies, in the best case scenario, that the same or a similar questionnaire will be used for a similar, but new sample. In such cross-sectional surveys, comparisons in time are only possible at population level. The questioning method often makes it unfeasible to develop a panel. Thus, the response from postal surveys is often so low that it is scarcely possible to work with a panel. This is well illustrated by the NIFA-panel, which suffered from a low response rate of 28%. If, however, higher response ratios are obtained, failing to establish a panel is in fact a missed opportunity, not only because many possibilities for analysis at micro-level are overlooked, but also because of cost considerations. In a cross-sectional approach, the sample must be reconstituted from scratch each time. Table 2.7 indicates, per survey, whether and in what way a longitudinal approach is pursued.

The interval with which both panel and successive cross-sectional surveys carry out questioning varies from one (IAB, NIFA, Hannover, ZEW) to five (CES) years. It is important to keep this period as short as possible, particularly with panels, so as to keep the number of drop-outs limited. For instance, WERS - which is held every four years - has only a panel section. In addition to a new sample from the research population, part of the sample from previous questioning is also contacted once again. This combination also occurs in NES. It produces two separate databases: one with a panel and one with two (similar) samples which allow for cross-sectional analyses.

The periodicity of questioning also depends on the research topic. If the questions are aimed at charting organisational structures, a longer interval is appropriate so as to register changes - including in the case of panels. Data relating to the in- and outflow of employees and their characteristics fluctuate more quickly and require a shorter interval.

Table 2.7 Panels versus cross-sectional surveys

	Time of questioning	Longitudinal character
<i>NIFA-panel</i>	1992, 1993, 1994, 1995, 1996, 1997, 1998, (1999)	Panel Main problem for longitudinal analysis with NIFA is the low response rates
Hannover	1993, 1994, 1995, 1996, 1997	Panel Monitoring organisations which took part in the original survey. Replacements made depending on drop-out rate
IAB	1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, (2002)	Panel Monitoring organisations which took part in the original survey (1993) i.e. 4,356 organisations. Replacements made depending on drop-out rate
LRD	Census of manufacturers: 1963, 1967, 1972, 1977, 1982, 1987, 1992 Annual survey of manufacturers since 1972	Panel (census) Monitoring organisations annually. Links to other databases such as NES, R&D, WECD
OSA	1989, 1991, 1993, 1995, 1997	Panel Monitoring organisations which took part in the original survey (1989). Replacement depending on drop-out
PASO	2002	Panel (as objective) Pilot study executed Febr.-March 2002. First wave May-June 2002
R&D panel	1987, 1989, 1991, 1994	Panel No further information available
WES	1996, (1999)	Panel (as objective) 1996 was the pilot questioning. The aim is to start in 1999 with a company panel of 7,500 organisations and 40,000 employees. It is striking that the employee questioning should also have a strong panel character
ZEW	Annual since 1993	Panel No further information available
AWIRS	1990, 1995	Partial panel Repeat cross-sectional study plus a panel component consisting of a sample of 698 workplaces from the AWIRS 90
NES	1994, 1996, 1997, 1998, (2000)	Partial panel Part of the sample is questioned again. For example, in 1997 and 1998 1,000 organisations which participated in 1994 were questioned again
WERS	1980, 1984, 1990, 1998	Partial panel A (separate) section of the sample in a given year consists of organisations from the previous round. This panel section is separate from the actual sample and is approached using a shorter questionnaire. The questioning of employee representatives and employees is not of a panel nature
WSI	1997, 1999	Partial panel Both surveys have independent samples, but in the second survey the units from the first one were questioned in addition to the new sample. However, due to high mortality the WSI gave up the panel character
<i>Eurostat</i>	2000, 2001	Successive cross-sectional measurements with identical sampling plan Feasibility longitudinal analysis is unclear, partly because some decision power is delegated to the 13 participating national statistical offices

Table 2.7 Panels versus cross-sectional surveys. Continued

	Time of questioning	Longitudinal character
<i>COI</i>	Organisation: 1993, 1997 Employees: 1987, 1993, 1997	Successive cross-sectional measurements with identical sampling plan The employer and employee questioning are a combination of two individual surveys carried out earlier
<i>ISI</i>	1987, 1990, 1993, 1997	Successive cross-sectional measurements with identical sampling plan No panel character in view of low response
<i>STV-TS</i>	1992, 1995, 1997	Successive cross-sectional measurements with identical sampling plan
Fortune 1000	1987, 1990, 1993, 1996, (1999)	Successive cross-sectional measurements with identical sampling plan Ex-post longitudinal analysis is possible for part of the sample (e.g. of 279 organisations which answered in 1993, 130 belonged to the Fortune 1000 companies which answered in 1990)
<i>NUTEK</i>	1995, (1999)	Individual samples Both questionnaire and sample were considerably expanded in 1999
STV	1999	Individual sampling New telephone survey in 2002, however, with larger population (including non-profit sectors) and different questionnaire
<i>AICD</i>	2000	Once only
<i>e-Envoy</i>	2000	Once only
<i>NOS</i>	1991	Once only
<i>Observatory</i>	2000	Once only
<i>Rutnet</i>	2000	Once only
<i>SOWING</i>	1998	Once only
DISKO	1996	Once only
Emergence	2000	Once only
EPOC	1996	Once only
MITI-MOL	1995	Once only

The panel character in combined organisation/employee questioning applies only to the organisation. The employees are drawn newly each time on a random basis from the participating organisations so that only cross-sectional analyses are possible at employee level. In view of the mobility of employees, the formation of a panel within these organisations is probably difficult to achieve. The most ambitious project currently underway is the Canadian WES, which is not only building up a panel of 7,500 organisations, but is also monitoring the list of 40,000 employees within these organisations, including one round in which they have left the organisation.

8. Scrutinising ICT and its link to innovation, the labour market and performance

In this final section we turn to the themes surveyed and the questions posed in the surveys. This inventory is a necessary step in the development of a modular instrument for measuring the use and effects of ICT on organisational structures and the labour market. Within the context of the STILE project, which aims to provide innovative methodologies and content for the statistical monitoring of the European labour market in the eEconomy, the basis has to be formed to collect this kind of demand side data in order to accurately monitor the labour market. This paragraph, therefore focuses on whether ICTs are covered in the questionnaires, and

if so, how this is done. Furthermore, attention is given on whether links to product- or process-innovation, performance and or labour market can be established.

Table 2.8 Questions or themes related to ICT, innovation, performance or labour market

Survey	ICT-related	Innovation-related	Performance-related	Labour market-related
<i>AICD</i>	All: use, internet, eCommerce, barriers, employees, costs, suppliers	Yes	Yes	Yes
<i>e-Envoy</i>	All: use, internet, eCommerce, client service, importance	Yes	Yes	Yes
<i>Eurostat</i>	All: use, barriers, eCommerce	Yes	Yes	Yes
<i>Observatory</i>	All: use, purposes, skills, training, hardware	Yes	Yes	Yes
<i>Rutnet</i>	All: internet, barriers	No	Yes	Yes
<i>COI</i>	Many: use, obstacles, application, employees, purposes	Yes	No	Yes
<i>ISI</i>	Many: use	Yes	Yes	Yes
<i>NOS</i>	Many: worker involvement, telework, use, purposes, need for training	Yes	Yes	Yes
<i>NIFA-panel</i>	Many: technical change, flexible production systems	Yes	Yes	Yes
<i>NUTEK</i>	Many: networks, actors, field, geographical connection, proportion of employees, use, purposes, integrated systems, communication, eCommerce	Yes	Yes	Yes
<i>SOWING</i>	Many: use, purposes, barriers, ICT and organisational innovations, evaluation and implementation	Yes	No	Yes
<i>STV-TS</i>	Many: software, micro-electronics, production process, administration, design, production and automation, workplace	Yes	No	Yes
DISKO	Few: use, work content	Yes	Yes	Yes
EPOC	Few: introduction	Yes	Yes	Yes
Emergence	Few: telecommunication links	No	No	No
IAB	Few: use, expenditure	Yes	Yes	Yes
MITI-MOL	Few: investments	Yes	Not available	Not available
NES	Few: use	Yes	Yes	Yes
PASO	Few: use, automation, informatisation	Yes	Yes	Yes
R&D-panel	Few: use of information networks	No	Yes	Yes
STV	Few: ICT use on a general level, logistics, automatisisation, EDI with customers and suppliers	Yes	Yes	Yes
Fortune	No	Yes	Yes	Yes
Hannover	No (1994)	No	Yes	Yes
LRD	No (yes in SMT and NES)	Yes (NES)	Yes	Yes (WECD)
OSA	No: technological change and implementation of new technologies, training, recruitment	Yes	Yes	Yes

Table 2.8 Questions or themes related to ICT, innovation, performance or labour market. Continued

Survey	ICT-related	Innovation-related	Performance-related	Labour market-related
WES	No: introduction of new technology	Yes	Yes	Yes
WERS	No: new technologies	Yes	Yes	Yes
WSI	No: on technical change	Few	Nearly none	Quite a lot
ZEW	Not available	Yes	Not available	Not available
AWIRS	Not available	Not available	Not available	Not available

ICT themes. Twelve surveys have reserved an important part of the questionnaire to ICT-related themes, of which five surveys (AICD, e-Envoy, Eurostat, Observatory and Rutnet) are completely devoted to ICTs, and seven have adopted a majority, or at a least a considerable amount of ICT-related questions (COI, ISI, NOS, NIFA, NUTEK, SOWING, STV-TS). In another nine surveys, the respective questionnaires contain a limited amount of ICT-related questions (DISKO, EPOC, Emergence, IAB, MITI-MOL, NES, PASO, R&D, STV). Four surveys (OSA, WERS, WES, WSI) do not refer to ICTs as such, but ask questions on 'new technologies', a concept that is too broad for our purposes. Other surveys are mainly concerned with organisation concepts and personnel policy. Eurostat has a somewhat peculiar status in this list, in the sense that it is not a regular questionnaire, but rather a modular instrument.⁴

Regarding the ICT themes dealt with in the surveys, twenty questionnaires are able to provide us with information on the use of ICTs, although the underlying definitions vary widely. For instance, AICD, e-Envoy and Eurostat survey ICT usage mainly in the sense of e-commerce, while Emergence is primarily interested in telework and geographical relocation as a consequence of ICTs. For NIFA ICTs are covered in the sense of flexible production systems. For SOWING, this is, somewhat similarly, organisational innovations. The NUTEK definition of ICTs covers all these three themes. Other surveys employ a rather broad conception of ICTs, asking more general questions on 'informatisation', terminals and micro-computers (COI) or ICTs and automation, informatisation (PASO).

Table 2.9 takes a closer look at the ICT questions of the selected surveys.

First of all, it should be noted that Table 2.9 does not investigate the quality of the questions nor the quality of the obtained information. Rather, it presents a first crude quantitative analysis on the measurement of ICT and ICT-related matters in the surveys. In the second column the total number of ICT-related questions in the surveys are given. However, these questions may be multi-dimensional. For instance, if the question is whether the skill levels of employees were an obstacle for the implementation of new technology, then the information obtained refers to the employees of the firm as well as to difficulties in the implementation of the technology. The question is therefore listed twice in the following columns, as referring to the internal labour market as well as to obstacles for the introduction of ICT. The number of questions that are listed twice are given in the third column. The high proportion of multi-dimensional questions in the NUTEK questionnaire is explained by an interesting form of cross-tabular question design in this survey. The fourth column classifies questions aimed at one or more the following types of information: whether ICT is used, what kind of technology is used, and for what purposes the technology is employed (functionality). Next, questions focused on ICT and staff or human resources issues in the broadest sense is listed, e.g. internal vacancies, skills, resistance from employees against implementation, but also working conditions and learning opportunities. The sixth column concerns those questions that attempt to reveal the link between ICT within the company/establishment and the external labour market, which also includes outsourcing. The next two columns count questions on instigators and obstacles to the adoption or (efficient) use of ICT, whereas the last summarises possible other types of information related to ICT questioned in the survey.

⁴ Eurostat made use of work done by the Voorburg Group who developed this modular questionnaire, which was then largely copied by Eurostat. Next, Eurostat contracted thirteen national statistical offices, to whom the liberty was granted of adding questions, but not of changing the modular instrument.

Table 2.9 ICT-related questions

Survey	Total	Multi-dimensional questions	Use and functionality	Internal labour market	External labour market	Instigators	Obstacles	Other
AICD	349	36	168	31	2	0	21	Plans: 19 Costs and investment: 111
SOWING	128	17	56	22	9	16	15	Implementation: 2 Innovation: 1 Impact: 18 Government: 6
Rutnet	87	2	22	20	3	9	14	Impact: 18 Implementation: 3
STV-TS	85	0	77	0	0	0	0	Future: 6 Production of software: 2
Eurostat	71	2	48	2	0	12	5	Decision making: 6
Observatory	71	0	32	3	23	0	0	Impact and benefits: 13
e-Envoy	59	10	37	14	3	0	14	Budget: 1
NUTEK	49	16	44	9	0	8	4	
ISI	44	0	42	0	0	0	0	Costs: 2
COI	42	4	18	8	2	5	7	Decision making: 6
NOS	23	4	4	19	4	0	0	
Emergence	9	0	9	0	0	0	0	
NES	5	2	2	5	0	0	0	
EPOC	1	0	1	0	0	0	0	
PASO	1	0	1	0	0	0	0	
STV	1	0	1	0	0	0	0	
IAB	8	6	4	0	2	0	0	Expenditures: 2
R&D panel	NA		NA	NA	NA	NA	NA	

Again, as was the case for many other criteria used for comparing surveys in this report, considerable diversity appears from Table 2.9. This is not to say that more questions necessarily offer more or better information. It is crucial to determine in advance exactly what is to be measured and what is not. Special attention needs to be given, for instance, to the construction of the response categories. Obviously, the definition of the population and the unit of observation, for which one wants to draw inferences, should carefully be kept in mind when designing the questionnaire. Likewise, realistic expectations on how knowledgeable the respondents are, can be decisive in terms of the quality of the results.

Table 2.9 gives a crude impression on how 'ICT-minded' the discussed surveys are at the level of the questionnaire and the actual questions provide a starting point for the construction of a modular instrument on ICT. Several conceptual and methodological matters should be taken to account in this construction process, and assessing how well the available measuring instruments are able to take these conceptual and methodological hurdles will prove to be very useful. Ideally, a qualitative perspective on the compliance of the questionnaire to methodological standards should be combined with a quantitative analysis on how well the questions perform in the field.

Innovation. Although innovation surveys confined specifically to the detection of product and process innovation (such as the CIS: Community Innovation survey) have a separate and distinct tradition, many of surveys included in this overview do also touch upon these issues in their questionnaires. This allows for a more in-depth understanding of the innovation performance of organisations as the underlying determinants in the organisational structures can be linked to their innovation potential.

Performance. Four surveys (e-Envoy, SOWING, STV-TS, Emergence) provide no possibility of assessing the impact of implementing ICTs, or organisational innovations in general, on performance indicators, simply because the latter are lacking. On the other hand, there are also four surveys that specifically aim at investigating the relation between ICTs and performance (AICD, Eurostat, Observatory, Rutnet). However, these are four surveys, that offer little possibility of longitudinal micro-level analysis, and in these circumstances it is rather doubtful if any serious impact assessment is possible.

Labour market. Finally, many of the surveys are concerned with the effects of changing organisational concepts as well as the implementation of ICTs on the internal and external (level and nature of the in- and outflow of employees) labour market. This allows for an analysis of the impact of new organisation concept on the reinforcement of internal labour market within organisations. With regard to the implementation of ICTs, these surveys offer the possibility to analyse the adaptability of the labour market and the risks for social exclusion.

Conclusions

A total of thirty organisation surveys have been subjected to a methodological benchmark in this comparative study. The aim of the paper has been, on the one hand, to detect good practices at the level of survey design and, on the other hand, to chart current methodological diversity. This last stage is important, with a view to strengthening cross-national research into the dissemination and effects of new organisational concepts. In addition an initial analysis has been made on the ICT-related topics included in the questionnaires in preparation of the establishment of an ICT module within the framework of the STILE project. Below we present the most important conclusions of this comparison of survey designs and ICT content (see also Sels, Huys & Van Hootehem, 2001, p. 22-24).

- 1) We observed a lack of organisation surveys which include small organisations and organisations in the services and public sector in the research population. In the future, attempts must be made to hold more unrestricted diverse (or multiple sector) surveys.
- 2) The lack of availability of databases based on which a universe of the research units can be compiled is a thorny problem in most of the surveys. This problem pushes the surveys into an occasionally undesirable restriction of the research population. Depending on the quality of these databases and the intention explicitly to include all possible organisations in the survey, an individual-based approach provides a good alternative, especially if the intention is to obtain a PPS sample of organisations. In this case, however, particular care should be taken to minimise the non-response at the various stages of the sample.
- 3) A sample frame based on strata by size and activity of the organisation is the most common. In this case, a fixed number of observations to be obtained per cell is determined in order to be able to make reliable statements about the various size/activity categories. A complete database of correct information about the research units is indispensable to a good sample frame and the extrapolation of research results.
- 4) Two-stage samples which combine questioning at organisation level with information collection at employee level produce surprisingly good results and are rich in possibilities for analysis. Changes at organisation level can after all be linked directly to their effects on employees. The surveys which aim for this combination report few difficulties in obtaining details about members of staff. The response from these employees is quite considerable. The objection of confidentiality does not therefore seem to play a role, at least not when the selection of employees can also take place on the spot, employees are not questioned during working hours and have complete freedom to choose whether to answer or not.
- 5) Accurate identification of the respondents is usually not possible, based on the available databases. A face-to-face interview has the advantage that this identification by the interviewer can take place on the spot. If the interviewer has been well-trained in this respect, this can improve the reliability of the data collection. In any case, it is a good idea to include the position of the respondent in the questioning, so that monitoring for any distortions based on position is possible. In order to limit the duration of face-to-face questioning (based on high response and low cost), the face-to-face questioning can be linked to a

written questionnaire which concentrates on a number of objective details concerning the organisation. In this case, it is also wise to collect the written questionnaires on the spot so as to keep partial non-response to a minimum.

- 6) Telephone questioning can produce a good response, but can only be used for short questioning. When setting up an organisation panel, a face-to-face interview seems the only possible alternative for ensuring a good response. All organisation surveys with a panel character therefore use face-to-face questioning.
- 7) If rapid periodic questioning is planned, the obvious method is to set up a panel. This offers more possibilities for analysis without incurring a higher cost. For research into topics which only evolve slowly (e.g. organisational structures) a longer interval can be used. In order to be able to understand the dynamics of this at organisation level, a new sample with a panel section can be supplemented after a longer interval.
- 8) Further encouragement of panel studies is indispensable. Based on cross-sectional surveys, one of the most important questions can of course not be answered: do changes in organisational concept precede higher performance or are only high-achieving companies in a position to implement new organisational concepts? Here, only panel data can offer a solution, where periodic data about the organisation concept are linked to performance indicators. The OECD (1999, p. 182) illustrates this same comment with a different but certainly no less salient example: "when studies are based purely on cross-sectional information, it is difficult to control for the reasons why the practices were introduced in the first place. If firms only began to experiment with new forms of working practices when they faced dire trouble, the existence of practices might be associated with poorer performance, at least over the short term." Moreover, it is important to be able to monitor a panel for sufficiently long a period, given changes in the organisational concept which progress only slowly.
- 9) Surveying the ICT usage in organisations is still often executed by means of separate ICT-surveys, as is the case with innovation. The exclusive focus of ICT usage, however, does not allow to monitor the consequences of ICTs on organisational concepts nor the internal and external labour market. In addition, many of these ICT surveys have a poor methodological basis, as is exemplified by their poor response rates. These considerations point to the need to include an ICT module into existing organisational surveys, thereby providing better data as well as a broader scope for analysis taking into account organisational structures and the implications for the labour market. Such a module is, moreover, an ideal vehicle to start a movement towards convergence between the organisation surveys in different countries, not merely with regard to survey methodology but also with regard to content, delivering a much needed improved international comparability between their results (Vickery & Wurzburg, 1998, p. 17). However, to achieve this comparability, much work needs to be done to align their conceptual frameworks used, the variables included and, in particular, the way in which these variables are operationalised in questionnaires.

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Part 2

Monitoring the impact of ICT on the labour market

By

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Introduction

Turbulence on the labour market

Knowledge and information are the key words that are used to depict the present day economic fabric. These powerful features of the economy are believed to be responsible for quite some turbulence on the present-day labour markets. Indeed, the new economy is believed to be knowledge-based and accompanied by a rising threshold of skills demanded by employers, but the more volatile markets and the shorter product cycles also entail a need for continuous renewal and updating of skills (Hasan, 1999, p. 53). Firstly, the inference of the higher threshold of skills required by employers stems from the simple observations that in recent decades many low-skilled jobs have been destroyed, demand for higher education levels has risen and that unemployment is highest among the low skilled. Therefore, “policies to encourage continued upskilling are almost certainly necessary to both social and economic advance” and this calls for supply side collective action as the appropriate successor to a Keynesian demand management strategy (Crouch, 1999, p. 30). Secondly, the need for reskilling is logically inferred from the volatility of markets: if companies endlessly need to adapt to changing circumstances, then so will their workers, because “the productive process evolves so fast that knowledge which stands at the cutting edge is scarcely likely to sustain its possessor over a lifetime’s employment” (Neave, 1999, p. 193). Whereas in the past, the employment relationship was one characterised by lifetime employment, the present and the future relationship therefore becomes one driven by lifetime employability, wherein the workforce should be non-stop involved in increasing their knowledge and skills in order to be continuously attractive on the labour market (Gaspersz & Ott, 1996).

This proposition of change at an ever increasing pace deserves some qualification and further scrutiny. At the root of the employability thesis lies an assumption of ever increasing technological change and constantly changing production processes. The present endeavour puts the focus on the role of information and communication technologies in all of this. After all, the information society is characterised by the increasing use information and communication technology. The first chapter pays attention to why information and communication technology deserves to be put at the centre of the research agenda. The second chapter explains how the research proceeded. The third and central chapter, casts some light on those organisation features, which are relevant to scrutinise as they are likely to experience an impact of the emergence of these new technologies. This chapter is subdivided in a part focusing on the division of labour and a part focusing on the consequences of ICT on internal and external labour markets. The objective is to point at the blind spots in the contemporary research agendas.

Chapter
5

Monitoring the Information Society

1. The need for international convergence of indicators

Economic globalisation has given rise to lively discussions among politicians, academics and others, who have taken an interest in societal development. The discussion is often focused on institutional and legal arrangements. Some fear a race-to-the-bottom with regard to social standards, in order to remain competitive in a globalised economy. Maintaining high labour costs for the purpose of financing high levels of social protection are believed to be at odds with economic growth (see for instance Mishra, 1999). Others argue that the impact of globalisation is generally exaggerated (see for instance Ferrera, Hemerijck & Rhodes, 2000; Esping-Andersen, 1999). Interestingly, many connect economic globalisation and the development towards a post-industrial economy with new communication and information technologies. Economic globalisation and communication technologies are then seen as the triggers generating a post-industrial economy. Building a favourable institutional environment and a productive and flexible workforce are seen as the means to smoothen this transition. With this respect, Castells speaks of a 'repoliticised' of capitalism, as governments are forced to "steer their policies towards collective competitiveness" (Castells, 1996, p. 89-90). In general, one can indeed observe an increased awareness of the impact of policy actions on the decisions of economic agents and of those managing (multinational) organisations. At the same time, there is an increased concern about the effectiveness of policies and policy programs. Consequently, this concern has also found its way in organisation studies. Maurice Sellier en Silvestre call this the 'societal effect approach', which says that "organisational outcomes differ quantitatively and qualitatively from one society to the next" (Sorge, 1995, p. 121, quoted in Van Hootegem, 2000).

All these concerns justify internationally comparable research on organisational development and the role that is played by information and communication technology in this development. In a first phase the aim should be to detect differences in labour market outcomes of decisions taken at enterprise level in diverging institutional contexts. As will be argued, current research frameworks do not sufficiently allow for this type of analyses. In a subsequent phase there should be striven for enhanced analytical possibilities of labour market dynamics. However, before the analysis of current research efforts can be undertaken, the appropriate unit of analysis should be determined. Additionally, a conceptual framework has to be chosen to depict the research topics that should be the focus of attention.

2. Unit of analysis: the organisation

The environmental conditions and challenges mentioned in the previous paragraph have severely influenced the current debate and the research efforts on the transformation of the economy and on the world of work. With this respect, numerous studies have indicated that there is, undeniably, a digital divide (Wintjes, Dunnewijk & Hollanders, 2002, p. 29; see also van der Hallen, 2001). On the other hand and specifically at the macro-level, digitalisation has a growth stimulating effect on all services, in which information exchange or communication is happening (Wintjes, Dunnewijk & Hollanders, 2002, p. 13). Consequently, information technologies are seen as an essential tool for maximising economic potential in the information age (see for instance Borghans & Ter Weel, 2000). After all "these may result in higher economic

growth”, and indeed “here the early evidence, however limited, appears to suggest that ICT are consistent with economic growth and job creation” (Campbell, 2001, p. 124-125). While the utility, or indeed the necessity, of new information and communication technologies, and consequently of ICT skills, for economic growth is widely recognised, macro-level employment figures do not exactly depict a watershed. Therefore, there can be no other conclusion than that, at the macro level, the inferno of mass technological unemployment has not become a reality (Borghans & Ter Weel, 2000, p. 108). So far, there is thus limited macro-level evidence of a positive relation between ICT usage in the economy and economic growth. However, macro-level evidence of a relationship between ICT and employment is rather indecisive. Perhaps, data collected at micro-level can shed some light at these relationships.

Widely discussed in academic circles is a research conducted by Krueger (reported in Krueger, 1993). The data presented in this article lend some support for the thesis of the ‘digital divide’. Krueger’s data demonstrate two strong relationships. Firstly, there appears to be a strong and positive relationship between the usage of computers and the level of education. Secondly, Krueger shows that, even when one controls for the level of education, for occupation and other common explanatory variables for salary, those who use a computer earn more than those who do not (Borghans & Ter Weel, 2000, p. 110-112). The conclusions that were drawn from this evidence was that an increasing process of polarisation is in progress, yielding sharp cleavages between those who possess digital skills and those who do not. However, the discussion that raised following the publication of Krueger’s article has compromised this conclusion. Discussing his findings, as well as other research reports, Rubery and Grimshaw conclude that major weaknesses can be identified in the methodologies used in studies which have generated the polarisation thesis (Rubery & Grimshaw, 2001, p. 182). Di Nardo and Pischke for example, show that the usage of pencils, a telephone, a calculator or even the fact whether one sits down or stands up during work can account for differences in salaries. It appears that the bonus for using of a pencil at work is even comparable to the bonus for using a computer (Di Nardo & Pischke, 1996; for a discussion see Borghans & Ter Weel, 2000; and Tijdens, 2001). While several replications of Krueger’s research have led to similar outcomes, the conclusions of Krueger’s article have thus been compromised. This was done by applying a simple methodological rule that says ‘correlation is not (necessarily) causation’. Apart from this, it is striking that the critiques have regularly referred to decisions made at the enterprise level.

The approaches discussed above have omitted the meso-level of the organisation from the analysis. Organisations are often regarded as open systems, forced to react immediately to any change that occurs in their environment. Whether these changes relate to new technologies, changing market conditions, conditions on the (economic or labour) markets, economic regulations, or labour market institutions or regulations, it is often assumed that organisations are obliged to react immediately to changes in any of these conditions. This line of thought is not upheld here: the premise is that organisations are not open systems, although the mentioned conditions are obviously important aspects when decisions are made at the organisation level. In fact, the argument is that a lot of dynamism on the labour market is overlooked, when organisations are being considered merely as a pinball of their environment and can therefore safely be omitted from labour market analysis. As a consequence researchers are less inclined to choose the organisation as a unit of analysis. Some observers choose a frog-perspective, whereby changes in functions are taken as an indication of a transformation of the organisation as a whole. It is however, possible that some functions do change, while the organisation remains largely the same as before. Others choose a bird-perspective, whereby an average company is derived from aggregated data, while it may be perfectly possible that the data contain completely different organisation configurations or developments (Van Hootehem, 2000, p. 13). Because “overall, the evidence from case study-analysis suggests that to understand the changing pattern of skill demand associated with ICTs, research needs to identify the interrelated roles of organisational structure, bargaining position and employer strategy. Large-scale data-analysis of the relationships between ICTs and skills often fails to draw these links. Technological change needs to be treated as an endogenous and contingent variable, not as an independent given.” (Rubery & Grimshaw, 2001, p. 184). This can be done, by rigorously choosing the organisation as unit of analysis. Obviously, the methodological rule of thumb ‘correlation is not causation’ is not automatically satisfied by this decision. Nonetheless, the right research design can contribute significantly to circumventing this problem.

Methodology

Detecting blind spots in contemporary research at organisation level

The explicit aim of this research project is to provide indicators for monitoring the impact of ICTs on internal and external labour markets. Different steps were made in order to reach this goal. In the first part of this document, an inventory was made in order to get a view on the research that is happening on organisational level. The information on the methodological aspects was used in the previous part to benchmark the existing surveys according to methodological criteria. This allowed to point at the analytical potential of the existing studies. Also, the collected questionnaires allowed to make an additional inventory of ICT indicators used in these surveys. This enabled to get a view on the 'state of the art' with regard to monitoring ICTs in existing organisational surveys. The indicators, which are discussed in this part are entered into a database. This database can be integrated in the digital toolkit, and can thus be made available for researchers who are intending to execute research at organisational level. An overview of the indicators discussed in this part, can thus be obtained. Ideally, the database of indicators can contribute to international convergence of indicators used in organisation studies.

The indicators collected in this way also serve as a useful input in constructing the ICT module, which is one of the ultimate goals of WP 4 of the STILE project. However, in order to construct a ICT module, which can be adopted in the existing studies, this inductive part has to be complemented by a deductive and conceptually underpinned part. In other words, besides using the existing work as an input for the construction of the ICT module, there's also a need to detect the 'blind spots', namely those research areas are not sufficiently explored by current research efforts. This endeavour is undertaken in the current part. The objective is not only to point at blind spots, but in the appendix, suggestions will also be made on how to fill in the blanks. Research instruments will be suggested, which can contribute to a more effective monitoring of the labour market consequences of information and communication technologies.

Chapter 7

Measuring the impact of ICTs in organisations

1. Changing Divisions of Labour?

1.1 Inter-Organisational Divisions of Labour

1.1.1 The role of ICTs in outsourcing: towards virtual enterprises?

With regard to inter-organisational division of labour, the concept 'virtual enterprise' has been launched (for a discussion see Vendramin & Valenduc, 2002). The proponents of the concept, observing the movements in which companies 'externalise' an increasing amount of activities, believe that these outsourcing-processes will continue at an increasing pace, reflecting the increasing instability of markets. Only the organisation's core activity will be maintained 'in-house'. Moreover, some predict that the definition of what constitutes a 'core activity' will be narrowed down too. And this is said to be facilitated by the introduction of ICTs. New information and communication technologies enable efficient and effective co-ordination between networks of organisations. Every little change in the environment can, when observed and entered into the network, lead to an immediate and effective response by a number of flexible machines or production processes, which may be located in different geographical areas. Unstable markets can yield a change in conditions anywhere and any time. Organisations operating in such an environment have no choice but to work with flexible and adaptable procedures and technologies. However, swift and effective responses are 'known' to be in contradiction with large-scale, and therefore bureaucratic, organisations. Evidently, one procedure or rule is a lot easier to change than a thousand procedures or rules and retraining one employee is much cheaper than retraining thousand employees. The red line running through the outsourcing philosophy can be summarised as follows: 'let somebody else do what you can not do better or (cheaper) yourself and restrict your own activities to the ones that give you a competitive edge'. If, in the past, the core activity of an organisation was, for example, to design and produce a wide range of electronic equipment, in an extreme hypothetical case, the organisation may be downsized to a handful of designers and engineers. These would only develop products, while all other activities would be performed by a network of small scale, subcontracted organisations. The organisation has thus become 'virtual', merely a knot of communications, in which information is distributed centrally, processed decentrally and transmitted again to the centre, only to be processed and distributed again.

The counter-arguments of the 'virtual enterprise' concept are empirical as well as theoretical. With regard to the latter, one can argue that the basic assumption underlying the concept of the virtual enterprise is wrong. As has been noted above, organisations are not the pinball of their environment, and if external elements change various responses might provide a solution. Even not responding can be a viable option. Obviously, organisations are conditioned, but not determined, by external circumstances or developments. Moreover, when organisations change they will do so on the basis of, on the one hand, the external situation or the environmental changes, but also on the basis of their own internal history. Additionally, organisations select the external opportunities available, while avoiding or circumventing the existing threats and risks. The transaction costs theory, for instance, attempts to identify these risks. Summing

up: there may exist different roads to success. And these theoretical arguments are supported by empirical data. Vendramin et Valenduc, observing organisations in different sectors of the economy and in several European countries report that they found no organisations moving towards some form of virtual enterprise (Vendramin & Valenduc, 2002).

While the term 'virtual enterprise' is most certainly an exaggeration which hardly corresponds to reality, ICTs can undoubtedly be used to co-ordinate an increasing amount of externalised activities. Still, it is doubtful whether organisations do indeed make use of this potential. Van Hootegem, for instance, while actually observing some organisational activities being externalised, equally observes movements going in the opposite direction, whereby activities formerly done by third parties are now being done by the organisation itself (Van Hootegem, 2000).

Turning to the scrutinised surveys, it is clear that a number of them attempt to measure the extent in which use is made of electronic co-ordination between the organisations and other organisations in their environment (see database concept 'organisational networking'). Nonetheless, it is doubtful whether ICT can serve as an important explanatory variable. After all, networks of organisations appeared long before ICT, as we know it today, emerged. Still, it is clearly relevant to monitor how the activities of organisations expand or decrease in number, as this has obvious implications for intra-organisational configurations as well for internal and external labour markets. And although transaction costs considerations are probably more relevant, information and communication technology can undoubtedly be a facilitating factor. In the appendix, an indicator is constructed, which attempts to measure the extent in which use is made of this potential.

1.1.2 ICT specialists inside or outside the walls of the organisation

When ICT skills are scarce on the labour market, subcontracting a specialised ICT company, in order to obtain the required skills may be a viable and welcome alternative. Indeed, organisations seem to contract other specialised organisations to realise the ICT implementation and also for the maintenance and updating of the 'informatisation-process' organisations make more and more use of specialised partners (Wouters & Van Hootegem, 1999, p. 1). These are the employees who are indispensable for the effective and efficient proceedings of the work process. Some expect an increase in the need for those employees, which are required to make these highly complicated production processes run smoothly. In the ideal-typical post-industrial world envisaged by Daniel Bell in 1978, this kind of workers were assumed to become ever more dominant in numbers on internal and external labour markets (Bell, 1978, discussed in Crouch, 1999). In case some parameters relevant to the process change, these specialists are needed to translate these changed parameters into the programmes that make high-tech and electronically controlled equipment work. In the light of the digital divide thesis, it is useful to investigate whether and in what extent these kind of employees are required in organisations. The question is whether organisations are increasingly populated with these kind of employees or whether they are rather small in numbers and concentrated in specialised departments, or even in specialised companies. Three surveys are interested to know who takes care of the IT activities within the company. COI asks if there is an IT function within the company, SOWING wants to know whether the establishment outsourced the introduction of ICTs to ICT servicing companies, and NOS wants to know who takes care of the design or management of the computer information systems. This kind of information can be highly relevant for the intra-organisational division of labour. When companies make extensively use of third parties to manage their information systems, this implies that these functions are not integrated into the organisations. There are also implications for internal and external labour markets as IT specialists, needed to maintain and/or adapt the system, are not employed within each company. By contrast, use is made of small numbers of specialised workers, concentrated in small numbers of specialised companies. This justifies data collection on this issue. In the appendix a suggestion will be made on how researchers can delve a deeper into the execution of advanced activities related to the implementation of information and communication technologies (see appendix).

1.2 Intra-organisational divisions of labour

1.2.1 Intra-organisational divisions of labour: new production concepts?

ICT, it is argued by some, may have the potential to instigate innovations in the organisation or structure of the production process. This is, because, process and product innovations are stimulated by ICT as a 'breakthrough' technology (WRR, 2000). Indeed, theoretically, the existence of decentralised networks and the existence of universal and flexible machines can be supportive of changes in production concepts. When information is created and received at decentralised level, then this is the level where the information processing and the information creation can happen. Flexible electronic equipment, which can be constantly adapted and modified, can fare well in the flexible environment of new production concepts. However, precisely the opposite may be feasible. Indeed, predictions related to the end of Taylorism as a consequence of ICT have not been confirmed by empirical research. Tayloristic work organisations appear in situations where ICTs are hardly used as well as in situations where ICT is an important production factor (see Steijn, 2001). This is because ICT equipment may just as well be used to centralise information, which would otherwise be processed decentrally. Electronically steered machines may contribute to sequential (cf. assembly line) work processes, which would otherwise be ill-fit for living up to today's challenges. In this respect ICTs can come to the rescue of traditional modes of organising production. Therefore, the statement at the beginning of this paragraph can best be regarded as an empirical possibility, rather than as an absolute law. While it may be true that Tayloristic production concepts make use of dedicated and specific technology, and that socio-technical oriented production concepts prefer small-scale and universal technologies (Van Hootegem, 2000, p. 170), it is clear that information and communication technologies can be reconciled with both these options. Whether production is organised in a sequential serial of production steps, or in subdivisions of functionally distinct, but internally homogeneous actions or in parallel, heterogeneous and autonomous subsystems, ICT can be used in any of these production configurations. Hence, Van Hootegem's statement that technological choices can play a conservative, just as well as an innovative role (Van Hootegem, 2000, p. 236), seems appropriate. Vendramin and Valenduc, for instance, describe the case of a bank where ICTs were at first employed in the beginning of the nineties for putting in place, what they call a Tayloristic production system.

"This entailed a strict division of labour, with clear boundaries between sales, credit, production and administration. The objective of this strategy was to generate rapid growth. Later on, growth slowed down and the relationship with the client was put to the centre. From then on ICTs were employed within the logic of the learning organisation. From now on, all the staff was supposed to have a minimum of knowledge of all domains of the enterprise. This means less strict boundaries between tasks, an increased polyvalence and more internal mobility." (Vendramin & Valenduc, 2002, p. 104 – own translation)

Meanwhile, these authors point to another organising principle underlying the Tayloristic production process, namely the concentration of those functions supporting the production process (for instance maintenance, administration or quality assurance) in specialised and autonomous departments. ICTs, however, can be the motor behind deconcentration movements as they enable the codification and standardisation of maintenance and quality control procedures, thus bringing some, perhaps the most simple ones, of these tasks closer to the productive function (see also Van Hootegem, 2000, p. 265-266). It even is a possibility that specialised departments will be fully dissolved in this deconcentration movement, and thus become a part of production or, at least of certain production processes.

ICT also open up new possibilities for the management and monitoring of production processes. Managers might be offered more and more effective ways of monitoring process sequences through information and communication technology, but ICTs may also offer a potential for fine-tuning or optimising the production plan decentrally (Van Hootegem, 2000, p. 262). In the latter sense, ICTs can nevertheless foster production concepts, which are divergent from pure Taylorism. In the former sense, ICTs are re-enforcing Tayloristic and central-

ised organisation models. These developments are not necessarily mutually exclusive, as they may occur simultaneously within an organisation.

Two surveys try to figure out whether ICTs have played a supporting role in 'a-Tayloristic' deconcentration movements (NUTEK and SOWING, see database concept 'production concepts'). SOWING also considers the opposite, and asks whether ICTs have led to greater control over the production process and this might give a clue on the 'organisation sustaining' character or 'organisation transforming' potential of these technologies. Interesting and inspiring operationalisations for measuring production concepts can be found in a number of surveys (see database).

1.2.2 ICTs and work organisation: designing functions

The above implies that, on theoretical grounds, an influence of information and communication technology on work organisation and on the design of functions can not be excluded. Possibly, some functions may simply disappear, as they are taken over by technology. For example, Van Hootegem, in some cases observed a shift from control by the human eye to control by the silicon eye. In quite a number of companies, controlling layers are abandoned from the hierarchy. In some cases such functions are altered into preparatory or supporting functions. In some cases these functions are simply swept away (Van Hootegem, 2000, p. 264). It is therefore recommendable that some measure on how the number of functions evolve in organisations is included.

On the other hand, while information and communication technology may render certain functions superfluous, the implementation of ICT within an organisation can at the same time give birth to new functions. These new functions may be specifically designed to execute tasks which came into existence because of the implementation of ICT. Obviously, information is required on the extent in which information and communication technology has permeated the work organisation. An indicator providing information on the proportion of functions in which employees work with information and communication technologies can therefore be appropriate.

Thirdly, there is the question on the extent in which functions are vertically or horizontally integrated. Information and communication technology could influence the content of functions, but the effect of ICT may exert an influence in contradictory directions. With this respect, Steijn introduces a distinction between two types of ICT based work arrangements, namely 'automated' and 'informatised' work arrangements. In 'automated' work arrangements ICTs are primarily used for routine tasks, for instance, data input and word processing. In 'informatised' work arrangements ICTs are used in a more creative and innovative way, for instance, using and maintaining databases, the analysis of databases, programming hard or software. Not surprisingly, Tayloristic work organisations are more often encountered in 'automated' labour situations and teamwork arrangements are more likely to be found in 'informatised' labour organisations (Steijn, 2001). If information and communication technology inspires managers to redesign in this direction of 'informatised' functions, than the fear for a digital divide may find confirmation in changing work organisations. After all, if these 'informatised' work arrangements contain functions requiring employees to uptake additional preparatory or supporting tasks (cf. vertical integration), it may also be true that organisations change their recruiting strategy. Creating functions in which employees are assumed to execute a broader range of ICT mediated tasks (cf. horizontal integration), may have similar outcomes in terms of recruiting strategy. Consequently, some categories of employees may not be able to live up to the expectations of these newly designed or re-designed functions

This is not to say that 'automated' ICT-based work arrangements do not permit a redesign of functions in the direction of vertical or horizontal integration. A stable automated process can put quite some 'spare time' at the disposal of management, as the (electronically steered) technology may take over some repetitive short cycled actions. Moreover, ICT may also contribute to the codification of those tasks which are supportive for the productive functions. This codified knowledge or information can be made available decentrally by means of information and communication technology. To the extent that this potential for decentralisation is used, there may be opportunities for task integration in productive functions.

Summing up, it is important to monitor how the work organisation takes shape, as there are clear consequences for the internal labour markets of organisations and for how the relationship of the organisation with the external labour market evolves. When two organisations with similar activities choose different options in the design of their work organisation, they are likely to have different needs in terms of (ICT) skills on their internal labour market. Also, these organisations may handle different selection criteria as they recruit on the external labour market. For assessing the impact of ICT on the labour market, the production structure and the related work organisation can therefore be regarded as key variables. The several surveys offer examples on how aspects of the work organisations can be measured. In the appendix, indicators will be suggested on how ICT and ICT-related tasks fit into the work organisation.

1.2.3 The diffusion and application of ICTs in organisations

While, in general, ICTs may prove to increase the effectiveness and efficiency of an economy at large, it may not always be advisable for an individual company to invest substantially in these technologies at a given point in time. A number of economic, financial and/or social factors may call for a postponement of this investment. Therefore, faster diffusion of ICTs is not always desirable, because the costs of adopting new technologies can often exceed the advantages. Therefore, “many firms will be better off waiting for future product improvements, for the price to fall, for improvement in their capability to effectively use new technology” (Arun-del et al., 1998, p. 19). The approach chosen may then be to continue to work with the machinery already in effect in the organisation. These existing technologies and machineries may then determine the room for manoeuvre when it comes to shaping organisational structures (Van Hootegeem, 2000, p. 246). It is indeed likely that machinery already in place determines the decisions that are taken. Information technologies can be employed to complement these existing machineries, and may therefore have an ‘organisation conserving character’, as their controlling, problem revealing and system-integrating character contributes to transparency and an increased capacity to co-ordinate the existing production structure (Van Hootegeem, 2000, p. 266).

While technology may have a conserving influence on the production structure, it is obvious that, in the meantime, quite some tasks can be taken over by this new ‘alliance’ of (old and/or new) technologies. This span of activities that are executed by technology is important, as it determines the elements that are used to build up the work organisation.

The PASO questionnaire does a remarkable attempt to map this balance between man and technology. This is also the only questionnaire that does an effort to measure the ‘span of activities’ covered by information and communication technologies. The PASO questionnaire also includes a comparable indicator that measures the effects of automation or mechanisation, without explicit reference to ICT technology. Both these indicators aim at finding out what kind of work is left to be executed by the labour factor when technology has been implemented in an organisation. The options are theoretically sound. Technology may not have been able to take over essential tasks from the employee, but is merely a tool to execute these tasks (ICT as an auxiliary instrument), with no substantial impact on the division of labour: the technology has not overtaken the human labour factor, but serves as a tool to facilitate work or to increase its productivity. Or, on the other hand, technology may have overtaken a massive number of tasks, but requires at the same time constant intervention and adjustment of the human labour factor (ICT in interaction with the employee). In this case technology has become essential for the work process, however, it requires constant steering by employees. The two other answering categories are located in between. Or, ICTs completely steer the actions of employees, and the latter have no autonomy whatsoever (ICT as employee). Either, ICTs have taken over the work tasks, but these technologies also require constant monitoring by employees in case the process does not proceed according to plan (ICT steering the employee). In the appendix an indicator is included of the ‘character’ of the information and communication technology, in order to assess its impact on the work organisation and its impact on the design of functions. The PASO indicator has been inspiring in this respect.

2. Dynamism on internal and external labour markets

Now that the turbulence that ICTs can cause in the organisation of production and in the work organisation is discussed, the mission of the STILE project comes in sight: monitoring labour market consequences of ICT adoption. Indeed, implementation of IC technology potentially leads to “the loss of jobs as well as to the creation of new ones. Therefore, the content of jobs change. (...) The character of occupations changes, some occupations disappear, other occupations emerge. These elements could lead to an increased dynamism of inflow and outflow on the labour market.” (WRR, 2000). This increased dynamism might favour some groups at the expense of other groups in society. Hence, the widely feared digital divide. Myth or reality? This is the question that should be answered. The thesis of the digital divide assumes that those possessing ICT skills will be productive in the digital age, those who are not will be excluded from the labour market or will be offered inferior jobs. Additionally, organisations may have to deal with a gap between the required and the available ICT skills. Underlying these propositions is the assumption that the ability to work with complex technology will be ever more important, but also that this requires ever increasing skill levels of employees. What these skills exactly are, is subject of a lively discussion. Monitoring how employees are assigned to different tasks may cast some light on the issue.

2.1 Reasons to recruit employees possessing ICT skills

The work organisation and the design of functions will determine the (ICT) skills, which are required by organisations. Possibly, the implementation of information and communication technology can contribute to organisational change, and can influence its direction. Through this transformation of work organisations and the changing contents of functions, organisations may be obliged to alter their recruiting strategy. The work organisation that will thus take form can determine whether the organisation will be in need of a moderate number of specialised ICT skills, or whether there will be a need for a rather large number of general ICT skills broadly applicable in the organisation. Functions that have been enriched with engineering, maintenance, or quality control tasks may indeed call for a different skill profile of employees entering the organisation. ICTs may have been the driving force, generating some ‘spare time’, and thus making functional integration possible (cf. *supra*). Information and communication technologies are therefore likely to continue to play a role in the newly created function. Logically, the possession of ICT skills may become an important selection criterion. Horizontal integration may have similar effects on the required skills, as organisations may seek employees equipped with skills resulting in immediate pay off in a wide range of tasks. All this may result in recruiting behaviour aiming at applicants having a broad, but not necessarily a thorough understanding of ICT. When these conditions in production concepts and in work organisations are not applicable, it may be a form of job rotation, which obliges organisations to seek for employees possessing ICT skills applicable in a wide range of work situations. In both these cases organisations will seek for broadly applicable ICT qualifications.

When the application of technology, nor the work organisation requires an inflow of general and broadly applicable ICT skills in the organisation, specific ICT skills may nonetheless be required for some specialised function(s) within the company. If these kind of tasks are executed within the organisation, the number of employees equipped with ICT qualifications will be small, but the qualifications will be rather specific. Unless, perhaps, the recruitment of ICT skills is considered to be important for building up an ICT potential for the future. It may be the case that ICT skills are not immediately employed in the existing work organisation, but are maintained in a kind of skills reservoir that may be useful when future challenges necessitate these skills. In this respect the organisation may “learn to possibly change in the future” (Van Hootegeem, 2002, p. 436).

There is a lack of indicators measuring the inflow of ICT skills into organisations. The Observatory survey included an indicator trying to measure the inflow of ICT-skilled personnel by using an list of ICT vacancies which organisations might try to fill. Unfortunately, this way of questioning only delivers information on the number of ICT specialists in an organisation. However, the challenge is to reveal the recruiting strategy of an organisation. More specifically, it would be appropriate to collect information on whether managers seek to recruit very specific

(ICT) skills, which can easily be put into practice in the existing work organisation. Or, whether an alternative strategy is preferred, in which management strives to realise an inflow of general, non-specific and not directly applicable skills, which implies that a strong role shall be assigned to the internal labour market. Secondly and partly related to the first point, it is extremely unlikely that the inflow of ICT skills in an organisation can be measured by listing the vacancies for occupations requiring any sort of ICT skills one can think of. The classification of occupations is likely to be obsolete from the day it is conceived. All other discussed questionnaires lacked any indicators for the inflow of digitally literate employees. Considering the fuzz about how (the need for) ICT skills transform the labour market and the concerns about the digital divide, it is astonishing how little attention this issue receives. An attempt must be made to fill in this 'blind spot' (see appendix).

2.2 Is there a misfit between required and available skills?

By contrast, the conviction that the fast development of information and communication technologies, has not been matched by a growing number of workers able to operate this equipment, is very well reflected in the scrutinised questionnaires. At the root of these kind of concerns is the assumption that organisations are compelled to reform and to implement new technology under pressure of their environment. However, the employees active on the internal labour market or the potential employees at the external labour market may lack the required skills. The way in which the issue is operationalised may be deficient. In most operationalisations (AICD, COI, e-Envoy, NUTEK, Rutnet and SOWING, see the database, 'external labour market') the respondent is asked to express his or her opinion on whether or not there is a misfit between required and available skills. It may be more interesting to construct quantitative and factual, instead of perceptual indicators. Also, it is desirable that researchers get a clearer view on what these required skills exactly are, as well as on the extent in which the available skills are divergent from the required skills. It may, therefore, be more rewarding to measure the kind of ICT skills, which are recruited by an organisations, as well as to monitor whether these skills are further developed from this point on, in combination with indicators measuring how these skills are applied in the work organisation. Therefore, indicators, which give an indication on the development of the internal labour market, are needed.

2.3 Outflow of employees: drainage of obsolete and inflexible manpower, or loss of highly valued skills

If an organisation is put under pressure to adapt, but finds that the current staff lacks the required skills to meet up to the technological challenge, an alternative may be to refresh the internal labour market. This may imply some form of shedding of inflexible and ill-equipped personnel. Fast technological developments may then lead to an increased outflow of employees. e-Envoy, NUTEK and SOWING might be quite right to consider, not only a lack of skills as an obstacle for the implementation of information and communication technologies, but also resistance of employees as a factor able to block technological and/or organisational change. Unfortunately, these surveys do not consider the speeding up of the outflow of these employees as an alternative employer's strategy to escape from this resistance. A second reason why scrutinising the outflow of employees may be worthwhile, is the lack of ICT-skills on the external labour market. Possibly, organisations may experience difficulties in keeping their ICT skilled personnel in house, since the 'ICT literate' have a wealth of opportunities on the external labour market (see for instance de Graaf et al., 1995). Because of this tension on the labour market, organisations unwillingly have to deal with this outflow of ICT skills. For these reasons analysis of the outflow of employees is required. Suggestions are made in the appendix.

2.4 Internal mobility: differences between the digitally literate and illiterate?

Disposing of non-adaptable employees may be an undesirable strategy, as organisations may face fierce resistance of unions or severe obstacles in the form of restrictive labour market

regulations. Therefore, 'draining' employees may be undesirable. Reshuffling of the internal labour market may then be a more appropriate strategy. An appropriate personnel policy, reinforcing the internal labour market can then become a rewarding strategy for obtaining or composing the right skill-mix in the organisation.

Following this strategy, individual upskilling can be rewarded, while those who refuse, or are unable to take part in this process are not necessarily pushed aside, but they may nevertheless be deprived from opportunities for promotion or from the opportunity to possess more favourable functions within organisations. This can permit to keep selection requirements in terms of digital skills rather modest, even in this digital age. Internal upward mobility can nevertheless stimulate personnel to acquire the desired skills. In this case organisations will to a lesser extent resort to the external labour market for acquiring ICT skills. Their internal labour market however, may be all the more dynamic. This necessitates the measurement of these internal labour market aspects in organisations. For assessing how information and communication technology influences the labour market, it does not suffice to monitor the behaviour of organisations as they recruit employees on the external labour market. On the contrary, organisations can choose to minimise the 'traffic' of in- and outflow of employees, by assigning a strong role to mechanisms, which enforce their internal labour markets. Generating mobility on the internal labour market is clearly one of these mechanisms.

2.5 Education and training: reconstructing the skill structure

A complementary strategy is to upgrade 'old' obsolete qualifications into 'new' up-to-date qualifications. After all, education or training can be regarded as a functional equivalent of recruiting (Van Hootegem, 2000, p. 430). And this is how it is understood by at least a few researchers who scrutinise organisations. Admittedly, the amount of attention devoted to ICT education and training is hardly overwhelming. Although there is considerable interest for education and training in a respectable amount of surveys, whether or not ICTs necessitate or inspire managers to implement extra training or education is rarely at the centre of attention, regardless of a few exceptions (NES, NOS, NUTEK, see database concept education and training). Yet, next to internal mobility, discussed in the previous paragraph, training or education is a second strategy for building a strong, cohesive and appropriate skill structure within the organisation. If it is true that ICT skills are becoming ever more important for organisations and if it is also true that there is a lack of availability of these skills on the external labour market, one might expect that this strategy will gain increasing popularity among managers. This justifies the inclusion of indicators in research at organisational level (appendix).

2.6 To what extent are the ICT skills company specific

Related to the precedent paragraph, is the question whether or not the ICT skills required in the organisation are company-specific or rather general in nature. This issue is specifically relevant for those adhering the employability concept. After all, in an ideal world the workers on the external and internal labour markets possess a maximum number of skills, which are useful or required in a maximum number of work situations. Company-specific qualifications are socially undesirable, as these qualifications offer no guarantees in terms of employment or income security. In our digital age, which is believed to be characterised massive turbulence, unstable and globalised markets, and uncertain and rapidly changing organisational configurations, general non-company or sector specific qualifications are desirable, both from a social point of view, as with regard to the objective of labour market flexibility. However, whether qualifications are company-specific or general non-company or sector-specific also has important repercussions for the internal labour markets of organisations and it relates to most aspects discussed in the previous paragraphs. General knowledge or skills are valued by more than one employer on the labour market. However, employers will be reluctant to invest in general knowledge, since the returns of their investment will be uncertain and insecure, because the employee might leave the company and the returns can be received by another company. And this is likely to happen, because this second employer did not have to invest in training and can therefore afford to pay higher wages (see for instance Oosterbeek, 1999). Again, a well elaborated internal labour market can come to the rescue. At the point of inflow

risks can be minimised, by keeping the inflow threshold, in terms of skills, low. In other words, management can choose to keep the selection requirements moderate. Training and education can contribute to the attainment of the envisaged or required skill structure. Internal mobility and an attractive wage policy can then prevent drainage of the internal labour market, which has thus been developed. Thus, company specificity of skills, as well as remuneration aspects may deserve empirical scrutiny. The database can provide some assistance for obtaining indicators. In addition, suggestions can be found in the appendix.

2.7 Considering the inverse relationship: Internal or external labour markets enabling changes in the division of labour

Another possibility worthy of consideration, is precisely the opposite of what is widely assumed. Perhaps, a lot of exaggeration has crept into the debate on new information and communication technologies and the social cleavages, which they are assumed to create. Perhaps, the above discussion has falsely given the impression that the transformation of labour markets is merely a consequence of changes in production concepts, related changes in work organisations and the implementation of new technologies. This creates an image of human resource departments desperately trying to bring the existing personnel in line with the changed work environment. The line of reasoning can, however, be inversed. Borghans and Ter Weel (2000) for instance, rightfully remark that there are quite some ICT skills available on internal and external labour markets, but that these skills are far from always used within organisations. Perhaps, labour markets are in this respect more flexible than is widely assumed, and perhaps organisations are more rigid than is widely assumed. This again calls for an appropriate work organisation and personnel policy enabling the organisation to tap these human resources already available as well as providing a learning potential to constantly renew and enhance these resources. And this is again an important argument why researchers should pay attention how inter- and intra-organisational divisions evolve in relation to internal and external labour markets. Possibly, deliberate or unplanned developments on internal labour markets may indeed contribute to changes in the work organisations.

Chapter
8

Conclusion**Missed opportunities in contemporary organisation research**

It is undeniable that information and communication technology has a transforming potential on contemporary organisations and on internal and external labour markets. Probably, few will disagree with this statement. On the basis of the surveys which were examined within the framework of workpackage 4 of the STILE project, there can be no other conclusion than that serious efforts of assessing the impact of ICTs on these issues are lacking. This all the more unfortunate, because evidence collected at micro- and macro-level do not provide satisfying answers. This satisfaction could be attained by collecting evidence at meso-level of the organisation. The arguments presented in this part imply that empirical research at meso-level should, on the one hand, focus on the division of labour, notably the production concepts and the work organisation and the nature of the technological installations and the way in which the work organisation is given shape. On the other hand, attention should be devoted to how the relationship with the internal and external labour markets is taking shape. A number of research issues have been identified. There can be no other conclusion than that these issues have received too little attention in research at organisation level.

Appendix

Building a modular instrument

In this appendix a modular research instrument is presented, in which suggestions are made for researching the effect of information and communication technology on organisations and on internal and external labour markets.⁵ The modular character of this instrument is expressed in the design of the individual questions as well as in the design of the module as a whole. Firstly, in the design of the questionnaire, the 'establishment' is assumed to be the unit of analysis. However, this can be easily adapted, in order to make the questionnaire applicable to the 'company' or the 'enterprise' as a research unit, by replacing these terms in the designed questions. This would also require adjustments, where, 'employees of the wider/mother company' is used as an item in the individual questions (Questions 5, 6, 7, 8 and 9). For research aiming at the company or enterprise as the unit of analysis this item has to be skipped. These adjustments will, however, not necessarily harm the value of the suggested indicators. Secondly, the proposed questions can, in principle, be applied to investigate the whole economy and all sizes of organisations. Obviously, there may be an important variation in the data obtained by some of these indicators, in relation to these variables. Still, detecting this variation may be rewarding in itself. Some indicators, however, may be less relevant for questioning very small organisations (for instance questions 12 and 13). Nonetheless, the empirical questions for which of this module seeks answers, are relevant across all sectors of the economy and across all sizes of organisations. Thirdly, with regard to the respondent, the module certainly requires a respondent with a good general knowledge on the organisation. As different aspects of the organisation are questioned, several respondents, each most knowledgeable on these different aspects, are likely to maximise the reliability and validity of the obtained data (see first part). However, in the design of questions, asking for much detail was avoided, so that one fairly 'knowledgeable' respondent should be able to answer all the questions with an acceptable degree of validity and reliability. A fourth point concerns the questioning method used. The objective was to construct questionnaire items, which can be used in postal questionnaires, as well as in face-to-face questioning methods. The latter, however, will yield higher general response rates, as well as higher item response rates. The design of the module attempts to minimise the complexity of the questionnaire items, and to maximise the item response rates, as well as to maximise the analytical potential of the data generated by the items. Still, this is always a precarious balance, which is difficult to find. In this respect, in the module, which is presented in this appendix, an emphasis has been put on continuous variables, in which the respondent is asked to fill in percentages. In postal questionnaires, this objective may be at odds with the objectives of reliability and validity of the collected data. Face-to-face questioning methods can allow to extend the length of the questionnaire, and may as well permit to increase the complexity of the design of the questionnaire. The decision taken with regard to this issue is up to the individual researcher. Fifth, subjective questions, in which the respondent is asked to give his opinion on the research issue, are avoided. And although an subjective impact assessment by the respondent can be valuable for investigating research topics which are difficult to operationalise in numerical indicators, this was considered to be inappropriate for the present objectives. Because the module should be useful in studies which are conducted once only, as well as in (repetitive) cross-sectional surveys, but most importantly, also in panel surveys, the choice was made to construct indicators aiming at factual information, which relates to the present situation in an organisation. On the one hand, in panel surveys, the historical dimension is inherent to the research design. On the other hand, subjective assessments may severely harm the reliability of the obtained data, because it is likely that the

⁵ The authors are very grateful for the comments, advice, and suggestions made by Markus Promberger in the construction of this modular instrument.

questionnaire is filled in by different respondents in the successive waves. The proposed indicators, may nevertheless prove to be useful in other research designs as well. Related to this is the issue of the reference period for which the respondent is interrogated. Generally, the questions apply to the present situation. When another reference period is required, the module leaves it up to the researcher to determine this period. For the sake of reliability, this period is nevertheless better kept short. How short this should be, is in part related to the questioning method. Finally, although the module may be most valuable as a whole, the indicators can be implemented individually. All indicators could individually yield valuable information on the use of information and communication technology in organisations or on the impact of information and communication technology on aspects of the internal and external labour markets. On the other hand, the module can also be supplemented by a number of other indicators, yielding an enhanced analytical capability.

Identifying organisations that use ICT

Indicators 1 to 3 can be regarded as filter variables, which allow to discriminate analytically between those observations who use information and communication technology and those who do not. Indicators one and two are complementary, indicator 3 can substitute the former two. In indicator 1 a generic definition of information and communication technology is used, which is derived from Bruneau and Lacroix (2001).

1. Does your establishment make use of ICT installations (*ICT installations refer to all electronic devices, apart from telephones and fax machines, capable of displaying, processing, storing or transmitting information, e.g. computers, electronically controlled machines*)?
 - Yes
 - No

2. Is your establishment equipped for electronic communication or electronic transmission of data via networks (e.g. internet, intranet, ...)?
 - Yes
 - No

3. What descriptions of ICT fit to your equipment? Tick all that apply.
 - Stand-alone Computer/PC
 - Stand-alone computer controlled manufacturing device%
 - Computer connected to a kind of internal network of any level (establishment, company-wide)
 - Computer connected pool or assembly of manufacturing devices of any level (establishment, company-wide)
 - Workplaces with access to internet or other external networks

Indicator 4, can point to the functionality of the networks which are detected in the former indicators. It can, however, serve as an additional filter variable.

4. Does ICT in your establishment provide an electronic link (e.g. networks for electronic communication or electronic transmission of data) between the following actors within or outside your establishment?
 - A link between the different organisational functions/departments within the establishment
 - A link between your establishment and other workplaces of your company your of which your establishment is part
 - A link between your establishment and external suppliers/subcontractors/outsourcing companies of your establishment
 - A link between your establishment and the clients of your establishment
 - A link between your establishment and public authorities
 - A link between your establishment and social organisations (e.g. trade unions, consumer organisations, NGOs)

Identifying complex ICT activities in organisations

In indicators 5 to 7, a distinction is made between three types of complex ICT activities, which require specific and advanced ICT skills. The indicators attempt to monitor whether these functions are performed in-house or whether it concerns services, which are executed by actors external to the organisation. These indicators can be combined in one indicator (“Are activities related to the creation, implementation and maintenance of ICT installations executed by your establishment”). However, splitting them up, as was done in the box below, generates more favourable analytical possibilities, as well as a more accurate description of the ICT activities, which are executed within (or outside) an organisation.

5. Are activities related to the creation of ICT installations executed by your establishment (*creating refers to all technical activities and decisions by which the establishment obtains the technology - ICT installations refer to all technological devices apart from telephones and fax machines, capable of displaying, processing, storing and/or transmitting information*)?
- Yes
 - No
- (If yes) Who is primarily responsible for the creation of ICT activities within your establishment?
- This is mainly done by own employees
 - These tasks are mainly performed by employees of the wider/mother company
 - These tasks are mainly outsourced to an external company or to self-employed persons
 - Others, specify
 - No, these activities are not relevant for the establishment
6. Does your establishment execute activities related to the implementation of ICT installations (*implementation refers to all technical activities or decisions by which the establishment makes the technology operational - ICT installations refer to all technological devices apart from telephones and fax machines, capable of displaying, processing, storing and/or transmitting information*)?
- Yes
 - No
- (If yes) Who is primarily responsible for the implementation of ICT within your establishment?
- This is mainly done by own employees
 - These tasks are mainly outsourced to an external company or to self-employed persons
 - These tasks are mainly performed by employees of the wider/mother company
 - Others, specify
 - No, these activities are not relevant for the establishment
7. Does your establishment execute activities related to the maintenance of ICT installations (*maintenance refers to all technical activities or decisions by which the establishment keeps the technology already in place operational, including problem-solving, user assistance and upgrading activities - ICT installations refer to all technological devices apart from telephones and fax machines, capable of displaying, processing, storing and/or transmitting information*)?
- Yes
 - No
- (If yes) Who is primarily responsible for the maintenance of ICT within your establishment?
- This is mainly done by own employees
 - These tasks are mainly outsourced to an external company or to self-employed persons
 - These tasks are mainly performed by employees of the wider/mother company
 - Others, specify
 - No, these activities are not relevant for the establishment

Indicator 8 should provide an indication on the externalisation of these activities in organisations.

8. Were the tasks, which are now executed by this/these external company/companies formerly done by own employees?
- No, these tasks are new in our establishment
 - Yes, these tasks used to be executed by employees of the establishment
 - Partly, these tasks are not completely overtaken by the external company/companies

Organisational networking

Indicator 9 measures the extent in which organisations execute activities, which are generally secondary to the core business of the organisation, e.g. it concerns those tasks which are not directly aiming at goods or services. More specifically, it concerns activities, which are, generally, supportive or preparatory to the production of goods and services. Indicator 9 assesses the extent in which ICT is used to establish a link between different organisational functions. In this way, the role that is played by ICT in organisational networking can be monitored, as well as the extent in which ICT plays a role in the co-ordination of different organisational functions.

9. Please indicate for the following organisational functions by whom these activities are executed. (*Only one applies.*)

	Mainly done by employees of this establishment	Mainly done employees of wider/mother company	Mainly done by self employed, persons or by an external company	Not applicable
General management	0	0	0	0
Logistics (transport of material, products or parts)	0	0	0	0
Client relations (processing of questions and complaints/delivering information and advice)	0	0	0	0
Financial administration, accounting	0	0	0	0
Recruitment/selection of employees	0	0	0	0
Training or education of employees	0	0	0	0
Pay roll administration	0	0	0	0
Marketing, sales, commercial activities	0	0	0	0
Research and development, development of new services, engineering	0	0	0	0
Facilitating services (security, cleaning, catering)	0	0	0	0
Maintenance of machines and tools	0	0	0	0

10. Please indicate for the following organisational functions whether an ICT link is present between these functions and other organisational functions in your establishment.

	Is ICT used to establish a link between the following organisational functions/departments and other organisational functions/departments of your establishment?	
	Yes	No
General management	0	0
Logistics (transport of material, products or parts)	0	0
Client relations (processing of questions and complaints/ delivering information and advice)	0	0
Financial administration, accounting	0	0
Recruitment/selection of employees	0	0
Training or education of employees	0	0
Pay roll administration	0	0
Marketing, sales, commercial activities	0	0
Research and development, development of new services, engineering	0	0
Facilitating services (security, cleaning, catering)	0	0
Maintenance of machines and tools	0	0

In the construction of indicator 11, inspiration was found in the Emergence project. The indicator aims at information on the delocalisation of work by means of information and communication technology. Not only the possibility of outsourcing activities is considered, but also the extent in which organisations delocalise their own activities is thus taken into account. After all, ICT may permit inter-organisational networking, but they may just as easily permit intra-organisational networking.

11. The following question is designed to investigate, whether ICT is used for performing organisational function at a distance from your establishment's premises. Please indicate for the following organisational functions whether they are *managed* from your establishment. If so, please indicate whether one of the descriptions in column three to six applies.

	Do you manage this function from your establishment?	Done by individual employees, employed by your enterprise who work from home or from multiple locations, thereby using an ICT link with your establishment	Done by groups of employees, employed by your enterprise, who work at offices at another location than your establishment's premises, thereby using an ICT link with your establishment	Done by individual self-employed workers, who work at another location than your establishment's premises, thereby using an ICT link with your establishment	Done by business service supply companies, who work at another location than at your establishment's premises, thereby using an ICT link with your establishment
Customer service	0	0	0	0	0
Sales activities	0	0	0	0	0
Data processing/typing	0	0	0	0	0
Software development/support	0	0	0	0	0
Accounting activities	0	0	0	0	0
Management, training and HR functions	0	0	0	0	0
Design and editorial creative work	0	0	0	0	0

The production structure

Whether or not there is an ICT department present at an establishment's premises (indicator 12) is important, because there are clear implications for the intra-organisational division of labour. If certain activities are performed by an ICT function or an ICT department, this also implies that these activities are not integrated into the functions of regular employees. However, these tasks may be partly executed by an ICT department, partly by employees possessing certain functions in the productive segment of an organisation, and partly integrated into the tasks of regular employees. These are relevant features of the production structure of an organisation, and they certainly have labour market relevance.

12. Is there an ICT department present at your establishment's premises or are the activities related to the development, implementation or maintenance of ICT installations the tasks of a special function at the establishment's premises, but not organised in a specialised department? (*More than one answer possible.*)
- IT department
 - Number of employees working in this department
 - Special function, not organised as a department, but integrated in the productive segment of the organisation
 - Number of employees occupying this kind of function
 - No special department or function is present in the establishment but these responsibilities are integrated into the functions of regular employees
 - Number of employees occupying these integrated functions

On the other hand, not only ICT activities are relevant, but also how ICT is embedded in the production structure is important (indicator 13). ICT may support deconcentration of activities in an organisation, or by contrast, support the centralisation of activities and responsibilities. A combination of both may occur as well. The aim of this indicator is to find out what role ICT plays in the production structure. If ICT is supportive of new production concepts in organisation, then these new production concepts may have an impact on labour market outcomes.

13. Which of the following relationships between information and communication technologies and the mode of organising the production process (of goods or services) best depicts the reality in your establishment. (*Only one answer is appropriate.*)
- Decentralised work organisation, in which supporting tasks (for example engineering of production, maintenance of the machinery or equipment, delivery of material or administration) are brought under the responsibility of executing employees (*executing employees are those directly involved in the production of goods and services*), therein supported by information and communication technology
 - Centralised work organisation, in which information technology is employed for centralising information on the production process in specialised departments, who take care of supporting tasks (such as engineering of production, maintenance of machinery or equipment) and preparatory tasks (such as the delivery of material and components, administration)
 - Information and communication technologies have enabled the delegation of responsibilities to the executing employees, but, at the same time, they have also enhanced the capability for centrally monitoring and steering the production process

Work organisation

The following indicators aim at information on how ICT is embedded in the work organisation. An implicit distinction is made between those employees who are directly involved in the production of goods and services (the core employees), and those employees who fulfill a supervisory, supporting or preparatory function to the production of goods and services (see also indicator 16). It is desirable that indicator 14 is at least repeated for the category of supervisory staff or line management, in order to get a grasp on how ICT is embedded in the hierarchy of an organisation, as this may be relevant for internal mobility issues within an

organisation. Indicator 16 below may yield information on ICT use in preparatory and supporting functions.

14. What proportion of executing employees (*executing employees are those directly involved in the production of goods and services*) work at an I(C)T station? (*An I(C)T station is an electronic device capable of displaying, processing, storing and/or transmitting information.*)
- %

It may certainly be the case that ICT is used for different purposes as one moves up the hierarchy within an organisation. Therefore, it might again be desirable to repeat also indicator 15 for the category of supervisory staff or line management. Also, in indicator 15, a distinction is made between different applications of ICT in the work situation, which are expected to differ in their degree of complexity.

15. For what purpose is Information and Communication Technology used by these executing employees, who work at an ICT station?
- o ICT is used by these employees to display, create, process and analyse digital information
..... % of executing employees using ICT for this purpose
 - o ICTs is used by these employees to display, create and process digital information
..... % of employees using ICT for this purpose
 - o ICTs is used by these employees to display or create digital information
..... % of employees using ICT for this purpose

Indicator 16 measures the degree of vertical integration of tasks, and tries again to reveal whether ICT is used in the execution of these tasks. An additional indicator on repetitiveness or short cycledness ("What proportion of executing employees perform repetitive task, in which the same actions are undertaken every 90 seconds"), may be useful to get information on the horizontal integration of the tasks of employees.

16. Who is primarily responsible for the following tasks in your establishment?
- o Preparatory tasks (determining the work method, work sequence, time scheduling, division of work)
 - o Executing employees
 - o Supervisory staff or line management
 - o Specific indirect function or department
 - o Not applicable
 - o Is ICT used by these employees for the execution of these preparatory tasks?
 - o Supporting tasks (quality control, adapting working methods, budget control, maintenance of tools and machines)
 - o Executing employees
 - o Supervisory staff or line management
 - o Specific indirect function or department
 - o Not applicable
 - o Is ICT used by these employees for the execution of these preparatory tasks?
 - o Co-ordinating tasks (co-ordinating work with the work of other executing employees, co-ordinating work with the work of indirect functions, co-ordinating work with third parties)
 - o Executing employees
 - o Supervisory staff or line management
 - o Specific indirect function or department
 - o Not applicable
 - o Is ICT used by these employees for the execution of these preparatory tasks?

While indicator 15 attempted to reveal for which tasks employees use ICT as a tool, indicator 17 attempts to reveal the kind of tasks which are independently executed by ICT. The indicator tries to obtain information on the 'dominance' of the technology on two dimensions: the production sequences and the decision-making processes. The indicator could permit analysis on how increasing degrees of ICT use in organisations relate to other variables, such as task integration or human resources policy.

17. How are ICT applied into the functions of these executing employees? Please indicate the proportion of employees for which a specific description applies (the way in which ICT is applied in the work organisation is relevant, rather than the extent in which ICT is applied).
- o *ICT is not applied* to steer the production process, *nor does ICT support* the decision-making process, they are, however, used as a tool for executing specific (e.g. word processing, transmitting information)
..... % of executing employees for which ICT is used for this purpose
 - o *ICT is not applied* to steer the production process, *but ICT does support* the decision-making process (e.g. information needed to take decisions is made available by means of ICT)
..... % of executing employees for which ICT is used for this purpose
 - o *ICT is applied* to steer the production process, *and ICT supports* the decision-making process of executing employees (e.g. ICT determines the process sequences, ICT makes suggestions or provides options for decisions which have to be taken)
..... % of executing employees for which ICT is used for this purpose
 - o *ICT is applied* to steer the production process, *and ICT take over* the decision-making process (ICT determines the process sequences, ICT independently makes decisions, for instance by means of flow charts, integrated into the software)
..... % of executing employees

Recruitment and the presence of ICT skills

Indicator 18 and 19 measure the inflow of ICT skills into an organisation. The same distinction as in indicator 15 is used. But this distinction is now translated into ICT skills and ICT tasks. The most advanced ICT skills are considered to be those, which are required for creating, implementing and maintaining ICT installations, as these skills require knowledge on the technical aspects, as well as on the functional aspects of the technology. The indicators can be divided to question different categories of personnel ("What was the required level of ICT skills among those employees hired for an executing/supervisory function"). An obvious additional and valuable indicator would be an indicator on the educational attainment of newly hired employees.

18. How many employees were hired by your organisation during the precedent (*x?*) year(s)?

..... employees

19. Of these newly hired employees, how many have to work at an ICT station in the execution of their job?

o % of the newly hired employees

What was the required level of ICT skills in the recruitment of these employees? Please indicate the proportion of employees for each level of ICT-skills.

o Advanced ICT skills: being able to or having knowledge about developing, implementing, or maintaining ICT installation as well as being able to display, create, process, and analyse digital information (e.g. being able to work with programming software having knowledge on technical aspects such as hardware components or networks)

..... % of hired personnel

o Complex ICT skills : being able to work non-routinely with software programs, which are primarily used for display, creating, processing and analysing digital information (e.g., analysing data or designing by aid of computer programs, working with specialised statistical software packages)

..... % of hired personnel

o Moderate ICT skills: being able to work non-routinely with software packages, which are primarily used for displaying, creating, and processing digital information, (e.g. word-processing, spreadsheets, presentation software, or e-mail, but also skills needed to operate electronically steered machines)

..... % of hired personnel

o Simple ICT skills: being able to use ICT installations for simple routine tasks, in which the emphasis is on displaying and creating digital information (e.g. using an electronic cash register, following the instructions on a monitor, or routine data-input)

..... % of hired employees

o ICT skills were not a selection criterion

..... % of hired personnel

Number 20 assesses whether ICT skills were monitored in the recruitment of new employees, although these employees do not work at an ICT station. An affirmative answer on this question may point to the construction of an ICT potential for the future.

20. For those newly hired employees, who do not work at an ICT station, did your establishment nevertheless execute an assessment of the ICT skills of these employees?

o Yes

o No

o Only, for some categories of employees

Indicator 21 attempts to map the present level of ICT skills among the employees of an organisation. Again, it might be rewarding to pose question 21 for different categories of personnel.

21. What is the present level of ICT skills of the employees of your establishment? Please indicate the proportion of employees for each level of ICT-skills.
- o Advanced ICT skills: being able to or having knowledge about developing, implementing, or maintaining ICT installation as well as being able to display, create, process, and analyse digital information (e.g. being able to work with programming software having knowledge on technical aspects such as hardware components or networks)
..... % of personnel
 - o Complex ICT skills : being able to work non-routinely with software programs, which are primarily used for display, creating, processing and analysing digital information (e.g., analysing data or designing by aid of computer programs, working with specialised statistical software packages)
..... % of personnel
 - o Moderate ICT skills: being able to work non-routinely with software packages, which are primarily used for displaying, creating, and processing digital information, (e.g. word-processing, spreadsheets, presentation software, or e-mail, but also skills needed to operate electronically steered machines)
..... % of personnel
 - o Simple ICT skills: being able to use ICT installations for simple routine tasks, in which the emphasis is on displaying and creating digital information (e.g. using an electronic cash register, following the instructions on a monitor, or routine data-input)
..... of employees
 - o No ICT skills, or ICT skills not known
..... % of personnel

Re-enforcing the internal labour market

Indicator 22 measures the provision of education or training in ICT skills within an organisation. In combination with indicators 19 and 21, it permits to get a clearer view on how internal labour markets are taking shape within organisations. An additional aspect of this internal labour market is internal mobility. An indicator on this mobility may be desirable ("How are vacancies filled in your establishment: internally or externally"). Diversification across different categories of personnel will again be rewarding. The wage policy can also be relevant in the re-enforcement of internal labour markets.

22. What proportion of employees received training or education to acquire ICT skills?

- o % of employees

How many days per employee did this training or education last on average in the year?

- o On average days/employee in the year

What proportion of training was devoted to learn the following types of ICT skills?

- o Advanced ICT skills: being able to or having knowledge about developing, implementing, or maintaining ICT installation as well as being able to display, create, process, and analyse digital information (e.g. being able to work with programming software having knowledge on technical aspects such as hardware components or networks)
..... % of employees following education or training to acquire this type of skills
- o Complex ICT skills : being able to work non-routinely with software programs, which are primarily used for display, creating, processing and analysing digital information (e.g., analysing data or designing by aid of computer programs, working with specialised statistical software packages)
..... % of employees following education or training to acquire this type of skills
- o Moderate ICT skills: being able to work non-routinely with software packages, which are primarily used for displaying, creating, and processing digital information, (e.g. word-processing, spreadsheets, presentation software, or e-mail, but also skills needed to operate electronically steered machines)
..... % of employees following education or training to acquire this type of skills
- o Simple ICT skills: being able to use ICT installations for simple routine tasks, in which the emphasis is on displaying and creating digital information (e.g. using an electronic cash register, following the instructions on a monitor, or routine data-input)
..... % of employees following education or training to acquire this type of skills

Of the days devoted to education and training in ICT skills, in what form was this education or training provided? Please fill in the proportion of days in education or training, which were supplied in the following ways.

- o % of days of internal, off-the-job education or training in ICT skills (provided by your own organisation)
- o % of days in internal, on-the-job education or training in ICT skills (provided by your own organisation)
- o % of days in external off-the-job education or training in ICT skills (executed by external providers of education and training)

Which of the following depictions best describes the kind of qualifications, which were generated by this education or training?

- o Only useful to follow technical procedures or to work with technical installations unique for your company
- o Useful within the company, but also within other companies with the same or similar activities
- o General qualifications, useful in the economy at large

Outflow of ICT skills

Finally, indicators 23 and 24 monitor the outflow of ICT skills out of the organisation.

23. How many employees have left your establishment during the precedent (x) years?

..... employees

24. From those employees who have left your organisation during the precedent (x) years, which were the level of ICT skills that these employees possessed? Please indicate for the following level of ICT skills the proportion of ex-employees who possessed this kind of skills.

- o Advanced ICT skills: being able to or having knowledge about developing, implementing, or maintaining ICT installation as well as being able to display, create, process, and analyse digital information (e.g. being able to work with programming software having knowledge on technical aspects such as hardware components or networks)
..... % of employees that have left the organisation
- o Complex ICT skills : being able to work non-routinely with software programs, which are primarily used for display, creating, processing and analysing digital information (e.g., analysing data or designing by aid of computer programs, working with specialised statistical software packages)
..... % of employees that have left the organisation
- o Moderate ICT skills: being able to work non-routinely with software packages, which are primarily used for displaying, creating, and processing digital information, (e.g. word-processing, spreadsheets, presentation software, or e-mail, but also skills needed to operate electronically steered machines)
..... % of employees that have left the organisation
- o Simple ICT skills: being able to use ICT installations for simple routine tasks, in which the emphasis is on displaying and creating digital information (e.g. using an electronic cash register, following the instructions on a monitor, or routine data-input)
..... % of employees that have left the organisation
- o ICT skills were not relevant in the functions of these employees
..... % of employees that have left the organisation

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