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Ageing of the Workforce

Key-note Presentations and Abstracts from a Workshop held in Brussels March 23–24, 1998

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Foreword

During Sweden´s presidency of the European Union, in year 2001, a large conference “Work Life 2000” will be organized. The aim of this conference is to draw the attention of politicians and other decision makers to the problems in working life, but also the large potential, in terms of human resources and productivity, of developing working life.

The preparations for this important event include a number of workshops on important issues in working life. In March 23-24 1998, such a workshop was organized in Brussels on “Ageing of the Workforce”. During this workshop, a group of eminent researchers in the field of aging and work brought together their expertise from areas such as Employment and retirement strategies, Learning and competence development, and Work ability and health. In each of these areas, a key-note address summarized the “state-of-the-art”.

The background of the workshop is the ageing of the European population, lowered ages of exits from the labour market, and increasing public costs for these early exits. Against this background it is indeed a question of survival to create a working life that preserves and supports the health and work ability of the ageing workforce.

The workshop was not a traditional research meeting. Rather, the intention was to draw together knowledge that may assist decision makers when designing future work systems. Therefore, at the end of the meeting, the participants agreed on general conclusions and recommendations. The scope of such activities is vast, and the potential benefits, for the individual, for organisations and for nations and the EU, are large. Moreover, a number of pertinent research questions were identified, preferably as a starting point for joint European research projects.

Solna, August 1998

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1.1 Adjusting to an ageing workforce in Europe - policy and practice.

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One of the most pressing issues confronting European societies is the impact of population ageing on employment and the labour market. European policy makers, employers and trade unions are increasingly having to come to terms with this new paradox. On the one hand there is an increase in the average age of the economically active population in the EU. Over the next 10 years the age structure of the population of working age will change significantly: the numbers of young people (15-19) will decline by over 1 million (-5 per cent) and those aged 20-29 will fall by 9 million (-17 per cent), while the numbers of persons aged 50-59 will grow by 5.5 million (+12 per cent) and the 60-64 age group will grow by 1 million (European Commission, 1996). However, on the other hand, as a result of the continuous lowering of labour force exit thresholds and the operation of age discrimination in the labour market, people over 40 are regarded as nearing the end of their working lives.

This new and increasingly urgent paradox has to be addressed at both macro- and micro-levels (by policy makers and within organisations). Several European governments, including Austria, Finland, France, Germany and Italy are currently reversing the public support they previously gave to early exit from the labour force and are seeking ways of reducing the opportunities for and costs of early retirement (Delsen and Reday-Mulvay, 1996). Some employers are also reassessing their attitudes towards older workers, with some even constructing a positive 'business case' for employing this group. This 'business case' is built upon five points: the return on investment in human capital; the prevention of skill shortages; maximising recruitment potential; responding to demographic change; and promoting diversity in the workforce (Walker, 1995, 1997). Some trade unions too are reconsidering their support for early exit strategies.

In short there are clear signs that the different European labour market participants are adjusting to the ageing workforce on the grounds of pragmatism, commercialism, good human resource practice and in the interests of justice and fairness. However practical action in pursuit of these aims has been taken by only a minority of European employers and public authorities. Moreover there are differences among European countries in the extent to which they have begun to adjust to workforce ageing (Walker, 1997).

This keynote lecture will cover four main points: the continuation of early exit, changing policy perspectives, the views of the social partners and some emerging examples of good practice drawn from the recent research I have completed for the European Foundation. Sections one to three focus largely on policy issues while section four concentrates on practical ones.

Ageing and employment: early exit.

The dominant characteristic of the labour market experiences of older workers in the EU is the steady decline in their employment rates over the last 20 years. The pace of decline varies

considerably between countries, particularly between the north and south of the EU but the trend is both unmistakable and persistent. The movement in the employment of older women differs from those of older men largely because of the cohort effect of increasing female participation in the labour force. However, when this cohort effect is disentangled the trend among older women is similar to that of their male counterparts (Guillemard, 1993).

It is well known that the main factors behind this growth in early exit from employment are demand-related and, specifically, recession, unemployment and redundancy (Walker, 1985; Trinder, 1989; Kohli, Rein, Guillemard, Van Gunsteren, 1991; Laczko, Phillipson, 1991). Indeed it has been argued that 'early retirement' or withdrawal from the labour market brought about through an increase in unemployment is better understood as a form of unemployment rather than retirement (Casey, Laczko, 1989).

Early Exit as a Goal of Public Policy.

One important aspect of the demand-side determination of early exit over the last 20 years has been public policies. Thus measures such as preretirement in Denmark and Germany, disability compensation in the Netherlands and the Job Release Scheme in the UK have actively encouraged the trend towards early labour force exit, sometimes as a means of substituting younger for older workers. In other words policy makers regarded older workers as a partial solution to unemployment, particularly mounting youth unemployment. (Of course this was one element of a general policy of labour supply reduction, which also included action to contract the inflow of young labour market recruits.) Moreover early exit was a solution that was favoured by both employers, who could reduce the size of their workforces or rejuvenate them with assistance of public subsidies, and trade unions, which were able to negotiate early retirement packages for their members, many of whom were keen to leave the labour force. The VUT scheme in the Netherlands, for example, was created by collective agreement.

The late 1970s and early 1980s, therefore, witnessed a high level of consensus between the social partners backing the policy of early exit. This does not mean that governments intervened in their national labour markets to the same extent - in fact differences in the level of such interventions have a bearing on the degree to which employers are now willing to depart from the policy of early exit - but the widespread acceptance of early exit was remarkable. Public early retirement schemes were oversubscribed in all European countries in which they were available and this remains the case where such schemes have been maintained. For example the bridging pension in Belgium covered 42 per cent of the early retired in 1979 rising to 60 per cent in 1992. The VUT in the Netherlands is used by 90 per cent of those eligible for early retirement and the take up of Invalidity Act benefits is 30 per cent between the ages of 50 and 54 and 60 per cent among those aged 55-59.

Unfortunately the policy of early exit entailed unforeseen consequences and, in retrospect, may be viewed as a short-term solution to the pressing economic problem of unemployment, the social and economic costs of which were never discussed openly (Walker, 1985) and which, as circumstances change rapidly, looks increasingly anachronistic. In the first place the growth of early labour force exit has diminished the role of public pension systems as the key regulators of retirement and, thereby, increased the precariousness of many older people in the labour market (Guillemard, 1993). Thus a whole range of *ad hoc* institutional mechanisms and benefits have been added to the social protection systems of the northern EU states to facilitate the early exit policy and bridge the widening gap between employment and retirement. However these benefits do not cover all older workers and many are left with little other than social assistance.

Secondly, the unchecked growth of early exit from employment reinforced the devaluation of older workers in the labour market. As age thresholds have been lowered to provide exit routes out of employment this has had significant consequences for those ageing workers left in the labour market because it is likely to have affected employers' perceptions of the age at

which workers may be considered to be 'too old'. In fact there is a growing body of evidence in different EU countries to show that people in their third age are frequently discriminated against with regard to job recruitment, promotion and training (McEwan, 1992; Drury, 1993; Walker, 1993).

Changing policy perspectives.

Recently there has been a significant shift in official attitudes towards early exit in a majority of member states. Most of those with public early retirement schemes or programmes that facilitate early exit have taken action to curtail or restrict access to them. For example, the Austrian government has abolished the early pension scheme which enabled men to retire at 59 and women at 54, the UK government abolished the Job Release Scheme, the Dutch government has restricted access to invalidity benefits and the Swedish government has removed labour market criteria as a qualifying condition for disability pensions. The main factors behind this shift are common to all EU countries - the rising costs of pensions, workforce ageing, recession and unemployment costs - but there are some differences of emphasis between countries. All member states are confronted by twin pressures: on the one hand, demographic change leading to workforce ageing and rising pension costs and, on the other, economic recession, relatively high unemployment and the deflationary impetus of the economic convergence criteria set by the Maastricht Treaty. These combined pressures have already prompted action in several EU countries to limit the extent of early exit. In addition the decline in youth unemployment in some countries has created some space for policy makers to turn their attention to older age groups and, increasingly, we may expect them to be forced to do so by the growing numerical strength of the older population and the rising political consciousness of this age group.

This does *not* mean that age and employment is an issue that is high on the policy agenda in all countries. For example among the nine member states represented in the European Foundation research (Walker, 1997) it is possible to distinguish two broad groups. In Belgium, France, Germany, the Netherlands and the UK the issue has a relatively high political profile, whereas in the remaining countries (Finland, Greece, Italy and Sweden) it occupies a relatively low priority. Out of the first group the issue of age and employment has a particularly high profile in France, Germany, the Netherlands and the UK. In 1993 the British Employment Minister personally sponsored a major publicity campaign aimed at employers to make them more aware of the issue of age discrimination and to encourage them to recruit more older people. The Dutch government adopted an even more pro-active stance and established an Age Discrimination Bureau to highlight this issue. Furthermore the Minister of Social Affairs has announced the intention of the Dutch Cabinet to legislate against unjustified age limits in job recruitment. This proposal stems from the day devoted to publicising age discrimination in March 1996, which received enormous media coverage. In France there is an ongoing debate on gradual retirement and new proposals in the national parliament. In Germany there is a Commission of Enquiry into Demographic Change set up by the Bundestag (German Federal Parliament) which submitted an interim report, in 1994, emphasising the need to encourage older workers to continue in employment. However the main focus of government interest appears to be the problems of pension financing.

In contrast, particularly in the two southern states that took part in the research, the question of the increasing average age of the workforce has not achieved any prominence in the national policy arena - though in Greece at least there are signs that this is changing. The main reason for this in the case of Italy appears to be that workforce ageing has been artificially avoided by a *de facto* reduction in the official retirement age. Even the debate surrounding the recent pension reform did not focus on actions needed as a result of the ageing of the workforce. Government action has been taken to implement the EU's guidelines on

greater flexibility in labour relations but the age variable has only rarely been taken into account. In Greece there has been some debate on the situation of older workers. The situation in the two new Scandinavian member states is quite different from their southern counterparts. In Sweden the traumatic experience of high unemployment has focused attention on the position of young people, immigrants and refugees rather than older workers. Also there is a political reaction against the employment protection law which is seen as an impediment to the creation of a flexible labour market. In Finland the absence of public debate about workforce ageing is partly attributable to the concentration on limiting the growth of early exit and partly to the long tradition of rehabilitation and occupational health legislation which has been adapted to improve working capacity among older workers.

Policy Pressures.

What are the main pressures behind recent policies towards older workers in the different member states? There is no doubt that the main engines of change are political and economic and, in particular, the desire to limit the social security costs associated with early exit and, indeed, with public pensions. This is the pre-eminent factor in Belgium, France, Greece and Italy and also in Finland and Sweden, and it is a major factor in all of the other countries. However, in each EU country there are specific national features to the debate and its policy prescriptions. In Italy, for example, the policy debate has focused, first of all, on the falling rate of replacement (the ratio between those aged 15-19 about to enter the labour market and those aged 55-59 about to leave it) which is predicted to fall below 80 per cent in the first 20 years of the next century as a result of the sharp fall in the birth-rate (from 19.1 per thousand in 1965 to 9.4 per thousand in 1993). Secondly there is the increase in people's working lives due to increased life expectancy, which often takes the form of work in the informal economy. Thirdly there is the steady rise in the age at which people start employment resulting partly from the extension of compulsory education. In combination these factors have led to pro-posals to reform the pension system and, thereby, to redefine the 'typical' pensioner by exten-ding the working life. In France the desire to limit pension costs has led to government action to both restrict the frequency of early exit, by offering partial retirement schemes, and to reform the public pension system with the aim of prolonging working life. In Sweden previously generous exit paths have been narrowed or closed and firms have been encouraged to take responsibility for counteracting exit from the labour market. However many Swedish employers have ignored these appeals and early exit has continued at a rapid rate.

The emphasis on the various factors underlying the recent policy shift away from early exit and, in some cases, towards pro-active policies on age and employment, appears to differ slightly in three of the nine countries in our recent research - Germany, the Netherlands and the UK. In Germany two pressures are driving policy - although they do not have equal weight. On the one hand it is felt that prompt action is required to develop employment policies and training initiatives in order to pre-empt predicted future labour shortages resulting from demographic change. On the other hand and much more influential are the political and economic pressures to reduce pension costs which resulted in the 1992 pension reform legislation which increased the pension ages. In 1996, the German government abolished the early pension scheme which enabled men to retire at 60 after at least one year of unemployment. A part-time employment scheme for older workers has been introduced instead but experts see little chance for its implementation at company level. Simultaneously, it has been decided to raise the pensionable age for men from 63 to 65 five years earlier than was planned in the 1992 pension reform act, and this will come into force now in 2001. The knock-on effect of this extension of working life is to further increase the need for employ-ment promotion among older workers. In the cases of the Netherlands and the UK there is an additional, less important, normative factor behind the new policy orientation. Following on

from the campaigns by women's groups and black and ethnic minority groups it is increasingly the case that representatives of older people in general, and older workers in particular, are complaining about age discrimination and demanding equal access to job opportunities (McEwan, 1992).

Thus the key factors that have created a new policy perspective on early exit and age and employment are the EU and national political and economic pressures to reduce social security and especially pension costs, pressures which are exacerbated by recession and high unemployment, current and predicted labour shortages resulting mainly from demographic change, and the increasing profile of age discrimination in some countries. In some countries additional factors are important such as the loss of experience and know-how with the premature departure of older employees (Belgium and France), and the unintended consequences of early exit and the ageing of the internal labour market (the Netherlands). These unintended effects of early exit include the loss of skills and know-how, the increase in company level social security contributions and the fact that early exit diverts human resources policy away from the development of age-aware programmes covering the whole working lives of their employees. Over-emphasis on early retirement schemes in some countries has excused employers from the responsibility of examining the link between career and age and from the development of good practice with regard to ageing workers (Walker, 1997). The common method of reducing future pension costs - raising pension ages - merely emphasises and extends the disadvantage experienced by older workers.

Continuing Exclusion from Employment.

Despite the obvious shift in the member states' policies towards early exit the reality of the labour market experience of large numbers of older workers in most EU countries is still exclusion from employment. In most countries older workers tend to occupy a relatively low status in the labour market, experience discrimination with regard to job recruitment and training and are disproportionately represented among the long term unemployed (Walker, 1997). The common method of reducing future pension costs - raising pension ages - merely emphasises and extends the disadvantage experienced by older workers.

European Context.

The issue of workforce ageing and the problem of discrimination against older workers, is now moving up the European policy agenda. When the European Observatory on Ageing and Older People was established, in 1990, it identified age and employment as one of the four key policy areas it would monitor (the others were incomes and living standards, health and social care, and social integration) (Walker, Guillemard, Alber, 1991, 1993). Consequently the 1993 European Year of Older People and Solidarity Between the Generations was partly focused on this issue, with the publication of the first major report on age discrimination against older workers in the EC (Drury, 1993). In addition the Eurobarometer survey specially commissioned for the European Year revealed, for the first time, that a substantial majority of the general public in all of the then twelve member states believed that older workers are discriminated against in job recruitment, promotion and training (Walker, 1993, p.26). At the end of the European Year older workers were confirmed, in documents from both the Commission and the Parliament, as a priority area for the planned second programme of actions on older people.

In mid-1993 the Commission produced the White Paper, *Growth. Competitiveness and Employment* which was approved by the heads of state as a basis for future EU action. The White Paper set the important strategic goals of a more flexible workforce and more flexible employment practices in order to meet the challenges of global competition. It provided the first public EU recognition of the implications of the ageing workforce, although it did not propose specific actions for older workers. The 1994 White *Paper European Social Policy: a*

way forward for the Union did not specifically mention older workers but referred to the economic need for older people to make an active contribution to society.

At the December 1994 European Council meeting in Essen, the Heads of Government and State confirmed the fight against unemployment as a paramount task of the European Union and as the central objective of economic policy. The European Council Declaration highlighted five key areas for action to improve employment, the fifth of which, improving measures to help groups which are particularly hard hit by unemployment, stated that 'special attention should be paid to the difficult situation of unemployed women and older employees'. The French Presidency of the European Council, in June 1995, saw the first political declaration at EU level of the need for special actions in this field. The Resolution on the Employment of Older Workers emphasised two key principles:

- the need to redouble efforts to adapt professional training and conditions of work to older workers' needs;
- measures should be taken to prevent the exclusion of older workers from the labour market and older workers should have sufficient financial resources.

The Resolution proposed specific actions to be taken by national governments and/or the social partners including raising awareness among employers of the consequences of making older workers redundant, promoting the reintegration of older unemployed workers and eliminating possible legislative barriers to the employment of older workers, although these are not binding on the member states. The Resolution also called on the European Commission to promote the exchange of information and good practice concerning the employment of older workers across the EU (for further information on EU actions on older workers see Drury, 1995). (Looking further afield the G7 Social Summit in Lille on April 2, 1996 called for measures to put an end to the 'waste of human resources' following the acceleration of early exit in the face of ageing societies.) Unfortunately the priority given to older workers in the June 1995 Resolution has not been reaffirmed by subsequent European Councils which have emphasised long term unemployment and youth unemployment. This was the case with the so-called Jobs Summit last November in Luxembourg.

Perspectives of the social partners.

Like governments in the EU the social partners - employers and trade unions - and their representative organisations are having to adjust to the new reality of workforce ageing. The differences between countries can be illustrated from our recent research.

France and Germany represent clear examples of disagreement between the social partners over the nature of the problem of workforce ageing and the required solutions. In addition, the trades unions and employers have adopted almost diametrically opposed positions on the issue of early exit in each country.

The stance adopted towards workforce ageing by several major French trade unions is, essentially, to wait for government initiatives. In the words of Guillemard and her colleagues (in translation):

> Before one can give serious consideration to combating age barriers to recruitment and training, one needs to possess a clear perception of the need for action. It is nevertheless patently clear that such a perception does not exist within France's four largest (multi-category) unions.

Most French trade unions have for various reasons favoured the continuance of early exit, even though they recognise the long term problems associated with the large scale use of

early retirement schemes. The introduction of phased early retirement, intended by the government to reduce the cost of early exit, has been generally welcomed by the unions. French trade unions are also clear about their response to discrimination against older workers in training programmes: the right to training should apply to every employee. However they have not formulated any specific proposals to overcome this exclusion.

French employers seem to have taken a more pro-active approach to workforce ageing than that of the trade unions. Large companies in particular have begun to recognise the drawbacks attendant upon the large scale use of early retirement schemes. Some of these companies are openly stating their opposition to the use of such short term policies and are looking at ways of introducing workforce planning measures designed to retain older employees. Various recommendations have been made to address the issue of workforce ageing including workforce management techniques, such as skills audits, greater flexibility in employment and the creation of employment networks. It is important, however, not to get these proposals out of proportion: in France early exit remains extensive and company schemes to retain older staff in employment are the exception rather than the rule.

In Germany the positions occupied in this conflictual relationship are reversed. Among trade unions the dilemma between favouring early retirement and extending working life is also prevalent and there are differences between unions on this issue. Unlike their French counterparts some leading German trade unions see dangers in the continual growth of early exit from the labour market, especially the short term exploitation of the workforce. Moreover they are actively campaigning for changes in the organisation of the working environment to ensure that all employees are able to continue in employment until their normal retirement age. German unions are also aware of the importance of training to the integration or exclusion of older workers, particularly the unskilled and semi-skilled, and fear that continued large scale early exit will bias training initiatives even more against the needs of older workers. For example the metalworkers union IG Metall has proposed, as part of the reform of collective agreements (Tarifreform 2000) to negotiate the incorporation of the right to receive subsidised training in order to enable workers to carry out a wide range of jobs. The aim also is to prevent a skills deficit arising by ensuring that individuals retain their ability to learn new skills throughout their entire working life. As long ago as 1975 the German trade union federation (Deutscher Gewerkshaftsbund, DGB) put forward the 'DGB Programme for Older Workers'. This document pointed to the existence of barriers to employment facing older workers and, based on the concept of solidarity, emphasised their rights to work commensurate with their inclination and capabilities. The proposals included active employment policies, such as job promotion and action to reduce working hours.

In contrast German employers' organisations emphasise the continuing need to reduce staffing levels, because of the effects of economic recession and global competitiveness, and they regard early retirement as a policy which is both acceptable to society as a whole and one which can be achieved with the agreement of most workers. Furthermore early exit is seen as beneficial in allowing the promotion of more junior staff and in reducing the average age of the workforce. At the same time employers maintain that the opportunities for taking on the older unemployed are minimal. Individual German employers refer to specific barriers to the employment of older people, such as the dismissal protection regulations enshrined in collective agreements which give special protection to older workers with a long service record (even though the qualifying period is 15-20 years!) and, in common with employers in other countries, the limited pay-back period on training older workers. However German employers do recognise that early retirement has contributed to discriminatory attitudes towards older workers on the part of some employers - the self-fulfilling prophecy referred to at the start of this chapter. This process is further reinforced by the reduction in the number of older employees participating in vocational training which is given as evidence of a general

fall in the motivation of older workers and in their willingness to participate in training initiatives as they become older.

Like their UK counterparts, German employers' organisations stress the importance of information campaigns designed to make companies more aware of the learning potential of older employees. In 1980 the Federal Association of German Employer Associations (BDA) published guidelines for companies which made various recommendations to increase the integration of older workers. Some employers in Germany are aware of the dangers of continuing with the policy of early exit, such as the loss of knowledge and skills, but none of the employer associations show any sign of a lessening of support for the early retirement trend.

These sharp differences between the two sides of German industry in their attitudes towards early retirement are well summarised by Frerichs:

> There is strong evidence that trade unions see early retirement as a problem and their response has been to make specific demands eg. initiatives to encourage the training and employment of older workers. However it is still the case that practical efforts to integrate this particular group into the working environment remain underdeveloped with a continuation at the company level of the de facto preference for early retirement. (quoted in Walker, 1997, p.33).

Different Employers. Different Unions.

Of course employers and trade unions do not hold a homogeneous perspective on age and employment. In both employers' and trade union federations there are frequently tensions and differences of emphasis depending on a variety of factors such as industrial sector and size.

For example there are differences in perception about age barriers between large organisations and SMEs, differences which stem in large part, no doubt, from the contrasting scope for action in large and small organisations. While not wanting to imply that all large organisations adopt one view and all SMEs another the national experts do report frequent differences in approach based on the number of employees in an organisation.

Among trade unions too there are differences in perspective and policies. These mainly reflect the contrasting conditions facing trade union members in different sectors of the economy. For example, in the UK, the major public sector and white collar unions (such as UNISON and MSF) have been particularly active in developing policies and briefing papers on age discrimination. In Greece there are wide differences in the approaches of unions to the issues surrounding age and employment depending on the sector and locations they represent. In those areas suffering high unemployment trade unions may have no alternative but to negotiate redundancy and early retirement (Westergaard, Noble and Walker, 1989).

A Trade Union Dilemma.

This emphasises the acute dilemma which often confronts trade unions when dealing with the issue of an ageing workforce. On the one hand trade unions are inclined to recognise the injustice inflicted on older workers by age discrimination and, to some extent, that early retirement reinforces ageism in the labour market. Yet, on the other hand, in the context of high unemployment, with little prospect of maintaining previous levels of employment or preventing plant closure and with the opportunity to negotiate attractive early retirement packages for their older members, many of whom may have worked in arduous conditions for long periods and who favour early exit in advantageous financial circumstances, it is not surprising that they do so.

For example, in the case of French unions, as Guillemard and her colleagues point out:

> The unions are aware of the problems which large-scale use of early retirement schemes can cause in the longer term, especially where the population as a whole is ageing. Yet it is difficult for them

> to champion the cause of retaining older staff. In the first place they would find themselves in direct conflict with corporate policies which regard the universal retention of older staff as inconceivable. *'Yet when they reduce their workforce, companies are not dismissing staff at random: in view of the methods used to raise productivity, there has been an accelerating trend towards harsher working conditions in recent years. Companies shed staff whom they classify as less profitable, particularly older staff* (representative of the General Confederation of Labour). In the second place, the unions would appear to be complying with the wishes of their members, who are very keen to retire early and continually request early retirement schemes. Lastly, they regard it as perverse to prolong working life, especially in the short term, in a country with over 4 million unemployed. (quoted in Walker, 1997, p.37)

Although some trade unions are aware of the dangers associated with a policy of early exit and even when they know that companies use the exclusion of older workers as a tool of labour management, nonetheless they have to enter negotiations in order to secure the best outcome for their members. In Germany, the intensive pressure to reduce staff levels has meant that local works councils have been under great pressure to conclude agreements which result in the premature exit of older workers. In doing so the local representatives are inclined to play down the negative consequences of early exit and emphasise the positive aspects, such as allowing older workers to withdraw from stressful working conditions. Indeed, as the French Christian Workers' Confederation admits:

> In practice a degree of complicity has existed amongst employers, employees and unions about early retirement. Even where no major surplus of staff was present, redundancy programmes were implemented to secure early retirement benefits.

This dilemma experienced by unions is heightened further by their broad concerns for workers of all ages. Thus full early retirement schemes have often been supported, particularly by trade union negotiators at grassroots level, not only on the grounds that they benefit older members but also that they pave the way for the employment of younger people. A change in union policy at national level may not be reflected on the ground, as is the case for the French Democratic Confederation of Labour's support for phased early retirement.

> The union experiences difficulty from time to time, and particularly in the iron and steel industry, in getting across the message that phased early retirement is better than full early retirement. It is easier to justify phased early retirement when it is not linked to a redundancy programme and compensatory recruitments are being made. (quoted in Walker, 1997, p.38)

Good practice in combating age barriers.

This last main section reports some results from the first European research to concentrate on good practice in the recruitment and training of ageing workers. First of all what is 'good practice'? It is most usefully defined with respect to specific policies and in this research we used the five main dimensions of age management in organisations - job recruitment (and exit); training, development and promotion; flexible working practice; ergonomics; job design; and changing attitudes towards ageing workers (Casey, Metcalf, Lakey, 1993) - to categorise aspects of good practice; and good practice was defined in relation to each of the five areas of age management.

Classifying Good Practice.

In general terms, we can say that good practice in the employment of older workers consists of combating age barriers, whether directly or indirectly, and providing an environment in which each individual is able to achieve his or her potential without being disadvantaged by

their age. In order to achieve this goal policies do not necessarily have to be labelled 'older worker' policies - there may be general human resource (HR) strategies that are of particular benefit to mature employees. For example a system of annualised hours has proved to be particularly helpful to ageing workers with caring responsibilities but it is not intended as an older worker-specific HR strategy. Inevitably the selection of examples of good practice entails a value judgement that a particular initiative is reducing age barriers in employment and that this is a desirable outcome. The dilemmas associated with this sort of judgement and the assessment of good practice are discussed in the research report (Walker, 1997).

It may be helpful to provide a few illustrations of the concept of good practice underlying the project and this is arranged according to the five different aspects of age management.

1. Job Recruitment.
   Here good practice means ensuring that older workers have either equal or special access to the available jobs and that potential applicants are not discriminated against either direefly or indirectly. For example, the absence of age bars and other discriminatory mechanisms in advertisements and other methods of recruitment. Another example is positive discrimination in recruitment to overcome age barriers. Good practice may also consist of self-employment. In non-workplace settings good practice may include specific skills training to improve job seeking/finding or employment counselling and job search support. It could also mean the provision of support to a self-help group of older people designed to promote their own employment or that of other mature people.

2. Training, Development and Promotion.
   Here good practice means ensuring that older workers are not neglected in training and career development, that opportunities for learning are offered throughout the working life and that positive action is taken where necessary to compensate for discrimination in the past. Examples of policies and practices designed to achieve these ends include the creation of a learning environment at the workplace; ensuring that training is available regardless of age; and making training 'older worker friendly' by tailoring it to the learning methods and experience of older employees or by providing special courses to redevelop the ability and enthusiasm to learn. Good practice in this area may be promoted by non-workplace based initiatives, for example, by the provision of training to older workers in community programmes, and short-term placements.

3. Flexible Working Practice.
   Here good practice may be defined as affording older workers greater flexibility in their hours of work or in the timing and nature of their retirement. Of course such flexibility may benefit younger as well as older employees (as with annualised hours) but, specifically, with regard to older people, such flexibility may be an important method of retaining this group in employment or provide an attractive feature for recruitment purposes. Certainly there is evidence of a desire on the part of older employees for greater flexibility in working practices and, therefore, good practice consists of accommodating these wishes as far as is practicable in different organisational settings. Examples of such flexibility include gradual retirement, flexibility over retirement age (including the possibility of working beyond normal retirement age) and the provision of training to older workers in community programmes, and short-term work placements.

4. Ergonomics/Job Design.
   Good practice with regard to job design may take the form of preventative measures or those intended to compensate for physical decline. On the preventative front there is a wide range of ways in which work induced illness and disability may be prevented by improved

job design, for example by the elimination of heavy lifting or violent twisting movements, the provision of beneficial lighting and seating. For those ageing workers that are experiencing physical decline it is possible to modify the workplace in order to assist them to maintain their productivity and, therefore, to remain in employment. For example changes in lighting levels to compensate for poorer eyesight or alterations to workstations in order to avoid arduous bending and reaching.

5. Changing Attitudes Within Organisations.
   The introduction of good practice in recruitment and training rests on the commitment of key personnel, such as managers, recruiters and employment service staff. Therefore changing the attitudes of such staff towards older workers may be a vital prerequisite to the development of good practice for older workers. Aspects of good practice in this sphere would include a positive approach to combating ageism and dispelling the way this is associated with ageing workers by, for example, the presentation of evidence from a variety of sources demonstrating the benefits of employing and investing in this group. Such evidence may include examples from within the organisation or from other similar ones or the results of more broadly-based scientific research. As well as raising awareness about the need for good practice in the recruitment and training of older workers there may be a need for special training in equal opportunities, with reference to age, or in the particular needs of an ageing workforce.

Developing Good Practice.

Information was collected from 22 in-deptch case studies carried out in Belgium, France, Germany, Greece, Italy, the Netherlands and the UK. The most important goal of the research was to emphasise the important lessons than can be learned, in terms of transferring good practice initiatives to other organisations and countries, from these detailed case studies (see Table 1).

What factors influence the decision of an organisation to develop good practice in combating age barriers? There are three main ones - two push and one pull factor - but the precise order of importance differs between organisations. First of all, there is the specific economic and labour market setting in which an organisation is operating. For example several initiatives were either developed in response to labour shortages or such shortages played an important role in determining their focus. Other initiatives were encouraged by labour surpluses. The shortage of qualified nursing staff is a familiar problem throughout Europe and two of the initiatives - L'Incontro (Italy) and the Onze Lieve Vrouw Middelares Hospital (Belgium) - were aimed directly at overcoming this deficiency by tapping into the pool of older nurses. In contrast the Employment Agency in Trento and the French insurance and chemicals companies introduced their good practice initiative in response to labour surpluses.

Secondly there are changes in public policy, such as the closing-off of early exit subsidies or the provision of special training grants and support for job creation. For example, the change in public policy favouring partial rather than full early retirement influenced the French insurance and chemical companies in their decision to alter their exit policies. The Dutch Job Exchange programme for teachers resulted in large part from a change in government policy towards the education sector.

Of course government, central and local, may influence good practice in different ways: it may pay for its development, it may regulate to ensure it happens, it may exhort organisations to comply with it or, as a direct employer it may introduce good practice into its own machinery. Public sector subsidies were essential to ensure that several of the initiatives got off the ground - including the Dutch Job Exchange project, Sahlwerke Bremen and the POPE recruitment agency (UK). Three case studies involved local government and demonstrate the advan-

tages of such semi-autonomous forms of administration. In particular the cases of GFAW (Germany) and the Trento Employment Agency illustrate the enormous potential for both job creation and the promotion of good practice in age management where there is devolved responsibility for employment and training.

As well as being a positive influence on the development of good practice the public sector may also act as an inhibitor. This negative aspect of the role of the public sector was illustrated in several initiatives - the main culprits being the social security and redundancy payments systems (Job Exchange, L'Incontro Coop) and the tax system (SISEMA).

The third source of impetus towards good practice is organisational culture. By this I mean the HR tradition, current personnel policies and management style which, together, may support and encourage the development of good practice or, alternatively, favour the retention of age barriers.

Some commercial organisations have long established traditions of consensual management and responsiveness to employees. Sometimes this approaches social partnership or what might be called stakeholder capitalism, as in the case of the Wilkhahn furniture company, and sometimes it reflects a more paternalistic family-based tradition, as with TITAN and DELTA in Greece. Thus a cultural context favourable to good practice in age management may be created by either the craft traditions or the family orientation of a particular company. But it may also derive from very different and more urgent contemporary pressures, as in the case of Fontijne Holland, which has a pro-training culture because of its need to survive in the highly competitive machine manufacturing sector. Similarly with the UK company Glaxo R & D which regards the retention and retraining of older staff as a vital element in maintaining its competitive advantage.

Implementing Good Practice.

If the examples of good practice are to be used to maximum advantage by the key actors in the labour market it is important to know how they were implemented and, in particular, what lessons may be passed on about the successes and pit-falls of that process.

As was noted above, in order to ensure the development of good practice in all quarters of the workplace, it may be necessary to embark on general action to change the organisational culture. The introduction of an 'age awareness' programme throughout an organisation is one, comprehensive, route to achieving cultural change and the one followed by the London Borough of Hounslow. While most of the other workplace initiatives did not go that far, it is clear that careful planning and preparation was one of the main keys to successful implementation. Fontijne Holland provides an outstanding example of pro-active implementation - including consultation with and responsiveness to staff and targeted publicity material published in the company magazine. The company's approach to implementation is a model of good practice for others to follow.

Much of the research on age barriers in organisations highlights the potential blockage on the implementation of good practice created by the discriminatory actions of line managers. (These may derive from discriminatory beliefs and attitudes or perceived pressures to achieve specific business goals, or both.) This was one of the factors that prompted DSM (Netherlands) to introduce a comprehensive 'age aware' HR strategy. In fact DSM already had a very positive organisational culture but, nonetheless, age barriers can still survive in an enlightened HR environment and, in this case, they were being perpetuated by some line managers. The attitudes of some line managers were identified as having a similarly negative effect within Glaxo R & D. Another UK company, St Ivel, had experienced problems in the implementation of its policies to combat age barriers due to the stereotypical attitudes of local managers. In response the HR department insisted that managers should try out older workers in positions they assumed were unsuitable.

Regardless of how receptive an organisational culture may be to the implementation of good practice, problems can occur in the process itself. The initiatives developed by Stahlwerke Bremen and DSM both encountered such problems - initial difficulties in persuading older trainees to attend seminars and lack of experience in the implementation of age awareness strategies - and overcame them by, on the one hand, redoubling their efforts to persuade older workers to take part as trainers and, on the other, by gradual policy implementation and experimentation.

The implementation of policies to combat age barriers also creates dilemmas for trade unions. However, although concerns were expressed by trade unions in the initial stages of several case studies, including L'Incontro and DSM, once the issues were explained to them their fears were allayed and they became supporters.

Guidelines for Good Practice.

When it comes to the main lessons to be learned from the implementation of the case studies there are four main guidelines for those intending to introduce good practice into other organisations (assuming that the external stimuli exist for such action).

1. Backing from senior management.
   There is a wide variety of different reasons why management may support good practice in age management but, without it, an initiative is not likely to proceed very far. This much almost goes without saying but, in thinking about the transfer of good practice, it is important to bear in mind that, in several initiatives, this support had to be campaigned for. The role of the head of HR in the French chemicals company and in the UK cases of St Ivel, Glaxo and Hounslow proved decisive in championing the cause of good practice.

2. A supportive HR environment.
   This does not necessarily have to be overtly older worker friendly in advance of the introduction of measures to combat age barriers. That was not the case, for example, with the three French companies but the value of training was recognised. All of the workplace case studies benefited from a supportive HR climate. In a few this included placing a high value on older workers (eg Stahlwerke Bremen, Wilkhahn GmbH and Glaxo). Where this occurred the companies involved had sound business reasons for doing so. As the case studies show, a supportive HR environment may be created by both a traditional culture (such as the Greek informal social contract model) and a managerial style (as in France and the UK).

3. Commitment from the ageing workers involved.
   Although all but one of the workplace initiatives is the result of top-down policy decisions there is no doubt that the support of the older workers concerned was a vital element of the success of the case studies. This was not always forthcoming initially and several organisations have gone to considerable lengths to persuade older workers to accept and 'own' the initiative, such as the running of special seminars.

4. Careful and flexible implementation.
   If all of the other elements behind the development of good practice are secured then everything rests on the implementation process. The experience provided by the case studies shows that there are nine steps to be followed to guarantee successful implementation:

- careful preparation, including research in recruitment trends and age profiles of employees and labour market projections;

- open communication both with staff generally and with the target group about the objectives of the initiatives, including the use of seminars, workshops and newsletters;
- early involvement of trade unions, works councils and staff associations;
- the early involvement of older workers themselves to take part in the operation of the initiative, which greatly assists with the implementation process;
- education and consciousness raising among line managers;
- staged implementation, including a pilot phase both to test the initiative and to demonstrate to any doubters that it can be effective (this can be carried out in a section of the organisation already predisposed to good practice in age management as a way of multiplying the impact of the experiment), regular monitoring and feedback with adjustments to the initiative if necessary;
- periodic assessment of impact and feedback once the implementation is complete;
- constant communication with all employees in order to avoid the development of 'them and us' attitudes, attention to other aspects of the working environment, such as arduous tasks and conditions, which may inhibit the example of good practice from achieving its intended effect.

In addition to these nine steps it is undoubtedly the case that the implementation of a specific good practice initiative will proceed most smoothly and be most effective if it is part of a broader HR strategy designed to combat age barriers.

Recommendations for Good Practice.

This final section brings policy and practice together by making some key recommendations, designed to encourage the spread of good practice at all levels of the European labour markets. These are selected from the full list contained in *Combating Age Barriers - A European Research Report.* The recommendations are addressed to the different actors in employment policy and practice.

Employers.

Combating age barriers and developing good practice in age management must be organisation-led. European governments have taken various forms of action at a macro level and the social partners now have important roles to play. Employers of labour, public and private, have the responsibility to create the conditions in which employees can manage their own careers and ageing. They have to recognise the implications of an ageing workforce. These are the key action points for employers who have decided to take concerted action to develop good practice in age management:

- development of an age-awareness policy aimed at all levels of the organisation, to be introduced in the form of an experiment which measures the impact on job recruitment, training and other aspects of employment;
- introduction of age-awareness training for HR personnel, managers and other key personnel;
- involvement of older workers themselves in discussions about age barriers and how to overcome them;
- supporting individuals or groups of staff who want to develop initiatives to combat age barriers.

For employers who do not want to embark on the extensive programme of measures outlined above, there are three key recommendations intended to make initial progress on combating age barriers in recruitment and training:

- examination of organisation's recruitment practices to see if age is used inappropriately;
- removal of age barriers in job advertisements;
- use of non-age specific training methods and, where necessary, training methods that are sensitive to the special learning requirements of older workers.

It is important to recognise differences between large and small/medium sized enterprises (SMEs) and the importance of the latter to European labour markets (for example in the Netherlands: 92 per cent of businesses have fewer than 10 employees and, in the EU as a whole, 90 per cent of workers are employed by SMEs).

While many of the above recommendations may be applied wholly or partially to SMEs, for example the removal of age barriers in recruitment and the use of non-age specific training methods, it is obvious that others require a sizeable organisational infrastructure. Nonetheless, as the examples of Fontijne and SISEMA show, it is possible for both medium size and small organisations to develop measures to combat age barriers and the employment prospects of older workers in Europe depend on them doing so. In the case of small businesses there is clearly an important role for trade associations, chambers of commerce or other umbrella organisations in creating the economies of scale to make some forms of training viable.

Ageing Workers.

If a primary duty of employers is to create the conditions in which individuals can manage their own careers and ageing then the latter have a parallel duty to take advantage of that opportunity. Likewise older workers outside employment need support and encouragement to take some responsibility for improving their own employment prospects. Some specific recommendations to ageing workers are:

- assessing their own training and career development needs;
- communicating training needs to managers;
- taking advantage of all training opportunities;
- acting as mentors to young people;
- adjusting to late career horizontal rather than vertical shifts (and the change in seniority-related wage increments that this will entail).

Trade Unions.

At the workplace it is undoubtedly the case that trade unions continue to face a dilemma: whether to defend the interests of current members or to promote their future interests. The following key recommendations may help to overcome this dilemma:

- representing the interests of all workers regardless of age;
- including in collective agreements recruitment and training measures which rectify the disadvantage experienced by older workers;
- undergoing age-awareness training;
- assisting older members to self-advocate about their access to training and career development advice;
- recognising the need for traditional career development patterns to alter.

National Employer and Trade Union organisations.

There is an important role for national organisations of employers and trade unions in highlighting the relationship between age and employment and disseminating examples of good practice to their members through education and information campaigns. In particular they should educate their local representatives about the disadvantages created by age barriers. These organisations can also act as a channel for information from other EU

countries. Professional organisations - such as the Institute of Personnel and Development in the UK - can play an important part in the dissemination of good practice.

NGOs in the Employment Field.

An important feature of this research is the demonstration of the significant contribution that NGOs can make to this field. The importance of both the health and social care sector and environmental protection for employment and economic regeneration in Europe emphasises the potential for NGO-led projects to recruit and/or train older workers or to assist their recruitment by others (such as the Middelares Hospital, Passantenhuis and L'Incontro Cooperative). Governments and local authorities should recognise and support this type of activity because it can promote both local/regional economic regeneration and the combating of age barriers. Moreover, as the examples of Trento and GEAW demonstrate, job creation for older unemployed men and women via NGOs can be highly cost effective.

National Governments.

The importance of the policy context for the development of good practice in age management has been amply illustrated by this project. The Member States occupy three crucial roles with regard to combating age barriers: they may direcfly finance or subsidise initiatives; regulate the labour market, or society in general, to oppose age barriers; and/or provide non-mandatory encouragement to employers. European Union and national government support proved crucial in several initiatives (public and private). In a few case studies it was regional government that proved crucial and, where regional institutions exist, the good practice initiatives should be used to demonstrate the enormous potential for action to create employment for excluded older workers and so contribute to local and national economic regeneration. National action is recommended on several fronts to ensure that governments lead by example as employers, contractors, legislators and rule makers.

Education:

- raising the awareness of employers to the hidden costs of age discrimination and the loss of older workers;
- public education to counteract the negative images of older workers and false stereotypes and to disseminate good practice (eg. Getting-On campaign in UK, the National Bureau on Age Discrimination in the Netherlands).

Employment Policy:

- governments should not take any policy action which counteracts existing incentives for companies to retain staff;
- the need for general employment policies which put greater emphasis on preventing unemployment and encouraging older workers to continue in employment;
- consideration should be given to the provision of short term subsidies for employers taking on older workers, for example in the form of reductions in taxes or social contributions;
- removal of age barriers in government job creation and training schemes;
- development of active labour market policies to aid the integration of disadvantaged groups such as older workers through, for example, the improvement of labour market services.

Pensions and Social Security Policies:

It is important for national governments to examine closely the relationship between pensions, social security and redundancy payments regulations and the employment of older workers. In at least two countries (Greece and Italy) they acted as a barrier to the development of good practice.

Specific Initiatives for the Inclusion of Older Workers:

In recruitment, it is important to recognise the distinction between internal and external recruitment. Internal recruitment may include older workers when, at the same time, this group is being excluded by the external recruitment process. The latter is easier for policy to tackle and this will influence the former.

- ban age limits in recruitment (as in Canada and the US and as intended in the Netherlands);
- encourage companies to establish comprehensive action programmes in age and employment - by publishing good practice guides, spreading information about successful initiatives, disseminating age awareness literature and course material;
- action to set standards in training (age aware quality standard) and in particular to encourage and assist SMEs in training;
- funding for NGOs to develop pilot projects.

European Union.

The European Commission has a vital role to play in this area by disseminating examples of good practice and encouraging the transfer of knowledge between the member states. The national differences in the social partners' understanding of the implications of ageing workforces and in the emphasis given to different aspects of good practice highlight the importance of the Commission's networking role. The key recommendations for action at EU level are:

- close examination of the Commission's own recruitment practices in order to eliminate age barriers;
- encourage greater sharing of knowledge and expertise on the relationships between age and employment and the implementation of good practice;
- include special measures for older workers in the next reform of the ESF;
- initiation of discussions with European organisations representing the social partners and representatives of older people about how age barriers may be addressed.

Conclusion.

The 1995 Council Resolution on the Employment of Older Workers called on the European Commission to organise an exchange of information, experience and good practice concerning the employment of older workers. The research summarised here is intended as a significant contribution towards that goal. The project has demonstrated that, in a range of EU countries, some employers, in both the public and private sectors and NGOs have begun to develop good practice in the recruitment and training of older workers.

I am not pretending that the examples quoted are representative nor that the majority of older workers across the EU do not continue to face age discrimination. But, rather, the intention was to seek out examples of good practice so that they may be used to illustrate both the existence of such initiatives and the lessons that might be learnt from their implementation. Although it is only a minority of organisations that are taking action to combat age barriers, the fact that some are showing the way and that they include leading European commercial companies and major public authorities, indicate a growing awareness of the importance of this issue.

There is no doubt that the Member States have begun to address the age and employment paradox - the coexistence of workforce ageing and extensive early exit - and now it is time for the social partners to take action. Hence the focus of this research on the practical steps

necessary to achieve good practice. The social and economic policy context is currently favourable towards combating age barriers and, as this research has shown, there are good commercial as well as human resource management reasons for doing so. *The European Portfolio* contains over 150 examples of good practice initiatives from nine countries, while *Combating Age Barriers in Employment - A European Research Report* reports the practical lessons to be learnt from the detailed case studies carried out in seven countries. The clear messages from this work are, first, that good practice in job recruitment and training benefits an organisation as a whole and not just older workers and, secondly, that failure to combat age barriers means the wasting of human resources, a risky business when faced with an ageing workforce.

References.

1. Casey B, Laczko F. Early Retired or Long-term Unemployed. *Work,Employment and Society* 1989;3:509-526.
2. Casey B, Metcalf H, Lakey J. *Human Resource Strategies and the Third Age: Policies and Practices in the UK*. In:Taylor P, et.al. Age and Employment, London, IPM, 1993.
3. Delsen L, Reday Mulvey G. Gradual Retirement in the OECD Countries, London, Dartmouth Press, 1996.
4. Drury E. Age Discrimination Against Older Workers in the European Community, London, Eurolink Age, 1993.
5. Guillemard A.M. Older Workers and the Labour Market. In: Walker A, Guillemard A.M, Alber J.(eds). *Older People in Europe - Social and Economic Policies*, Brussels, CEC. 1993.
6. Kohli M, Rein M, Guillemard A.M, van Gunsteren H. *Time for Retirement*, Cambridge, CUP, 1991.
7. Laczko F, Phillipson C. *Changing Work and Retirement*, Milton Keynes, OU Press, 1991.
8. McEwan E. *Age: the Unrecognised Discrimination*, London, ACE Books, 1992.
9. Trinder C. *Employment after 55*. National Institute for Economic and Social Research Discussion Paper no 166, 1989.
10. Walker A. Early Retirement: Release of Refuge from the Labour Market*?. The Quarterly Journal of Social Affairs*. 1985;1:211-229.
11. Walker A. *Age and attitudes*, Brussels, EC Commission, 1993.
12. Walker A. *Investing in Ageing Workers - A Framework for Analysing Good Practice in Europe*. Dublin, European Foundation, 1995.
13. Walker A. *Combating Age Barriers in Employment* - A European Research Report, Dublin, European Foundation, 1997.
14. Walker A, Guillemard A.M, Alber J. *Social and Economic Policies and Older People*, Brussels, EC Commission, 1991.
15. Walker A, Guillemard A.M, Alber J. *Older People in Europe: Social and Economic Policies*, Brussels, EC Commission, 1993.
16. Westergaard J, Noble I, Walker A. *After Redundancy*, Oxford, Polity Press, 1989.

Table 1. Profile of Case Studies.

Country/Name	Main Focus	Sector Classification	Size of Organisation
Belgium			
1. IBM Skill Team	Recruitment	Private Business Services	Medium
2. Onze Lieve Vrouw Middelares Hospital	Recruitment	Private Health Care	Medium
3. The Passantenhuis (day centre)	Recruitment	Non-Profit Social Care	Small
France			
1. Furniture Company	Recruitment	Private Manufacturing	Large
2. Insurance Company	Flexible Employment	Public-Profit Financial Services	Large
3. Chemicals Company	Flexible Employment	Private Manufacturing	Large
Germany			
1. GFAW (Thuringia)	Recruitment	Public Employment Agency	Small
2. Stahlwerke Bremen	Training Ergonomics	Private Steel Production	Large
3. Wilkhahn Gmgh&Co	Integrated	Private Furniture Manufacturing	Large
Greece			
1. TITAN Group	Training Recruitment	Private Cement Manufacturing	Large
2. DELTA Model Milk Industry	Training	Private Food Production & Distribution	Large
3. SISEMA (Car Mechanics Association)	Training	Non-profit Trade Association	Large
Italy			
1. L'Incontro Coop	Recruitment Flexible Employment	Non-profit Social care	Small
2. IBM Sernet	Recruitment	Private Business Services	Small
3. Province of Trento (Employment Agency)	Recruitment	Public Public Administration	Large
Netherlands			
1. Fontijne Holland	Training	Private Machine Engineering	Medium
2. Forum Wisselwerk (Job Exchange)	Training Flexible Exployment	Non-profit Business Services	Small
3. DSM	Integrated	Private Chemical Production	Large
United Kingdom			
1. St Ivel	Integrated	Private Food Production & Distribution	Large
2. Glaxo R&D	Integrated	Private Research & Development	Large
3. POPE Recruitment Agency	Recruitment Training	Non-Profit Employment Agency	Small
4. London Borough of Hounslow	Integrated	Public Public administration	Large

Source: National Reports. Note:Small = under 100 employees, Medium = 100-149, Large = 500 plus

1.2 Work time adjustment for older workers in France; lesson from a four-year experience (1993-1997).

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Work-time adjustment is one of the most effective deployment policies for various categories of worker (e.g. workers with stressful functions, handicapped) or for workers at various moments of their career (e.g. apprentices and students, adults with family or other responsibilities) and is being used extensively. It is considered one of the most effective and easily implemented strategies for adjusting work to suit workers at end of career.

In several European countries (France, Germany, Austria, Finland and Denmark), through recent legislation, the authorities are actively engaged in attempts to reverse the trend towards early retirement and are using work-time adjustment, in particular gradual retirement (sometimes called part-time or gradual early retirement) as a substitute for full early retirement. Because the term 'gradual retirement' implies that the worker is on the way out, we prefer the term 'work-time adjustment' which implies the adaptation of working time to changing abilities and desires of workers at end of career as at other times of working life.

The paper focusses on:

1. The concept of work-time adjustment, and its pros and cons both for employers and employees: for example, effects on wage-cost, absenteeism, skills and expertise, job satisfaction, age management.
2. The existing French scheme of work time adjustment and examples of practice: Since the early nineties but expecially since 1993, French government policy has attempted to reverse the early retirement trend. By providing subsidies and incentives, a scheme of work time adjustment (phased retirement) has developed well over the last four years and has great potential. It is designed essentially for voluntary employees from 55 to 65 years. The employee earns a wage paid by the employer for the part-time he has worked and until retirement receives for the unworked half-time a supplement equal to 30 per cent of the daily reference wage (up to a ceiling). This scheme has the approval of both employer representatives and the Unions. Enterprise leaders view the scheme as an opportunity for off-loading certain categories of employee, for rejuvenating the age profile of their work force, for developing part-time throughout their staff structure and for improved management of work-force skills. The Unions and workers see it as a way of reducing work hours on favourable financial and occupational terms for flagging employees approaching end of career. By the end of 1996 this scheme involved over 50.000 private-sector workers benefiting from State subsidised schemes. In 1997, it was expected that 25.000 new comers would be joining such schemes. Firms in all sectors (hospitals, building, manufacturing, services, banking and insurance) and of all sizes have been involved. Work time reduction also facilitates skills transfer and the supervision of new-comers to the work force to fill the works hours vacated by part-timers - "traineeship schemes" is the name given to such supervised apprenticeship arrangement, most frequently encountered in industry and construction.
3. Lessons to be learnt: Success factors and recommendations. Main success factors: Management commitment, experience with qualified part-time work, career planning, social protection, trade union support and overall policy. We shall see that recent reforms risk jeopardizing the future potential of this kind of scheme (e.g. less advantegeous conditions for employers), and that it is essential that public policies are simple, clear and remain stable for a few years.

1.3 The study of ageing in the Netherlands.

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In this paper a description is given of the way research on ageing developed in the Netherlands during the last 20 years, particularly as it was stimulated by the Dutch governement. A few facts: Due to a very high birth-rate after the war there was a relatively slower start of "greying" of the Netherlands' society. Life expectancy in the Netherlands is and will be at a higher level than in nearly all EU-countries. It is clear that, given the significant decrease of the working as compared to the non-working part of the population, the Dutch welfare state is reaching its financial limits. Research a.o. into factors that determine decreased work ability at an older age, or the decision to retire, was considered of high importance.

Until the beginning of the 80's research in this field was carried out by a few capable researchers, but their activities were scattered and not well coordinated, leaving gaps and white spots in the research field as a whole. Furthermore, their approach was monodisciplinary, and there was a lack of funding for a more systematic, comprehensive study of the ageing in the Netherlands. At the end of the 70's a first initiative was taken by the Ministry of Culture, Recreation and Social Work to set up a Planning Group for study of the ageing. This led to the creation of a Steering Group for Research on the Ageing in 1982, with the task to commission, to evaluate and to adjust a research programme for a period of 5 years. A total of 83 projects were subsidized within this framework. After this period a new Steering Group was set up to monitor what was then called the NESTOR (Nederlands Stimulerings-programma Ouderenonderzoek) programme. The overall goal of NESTOR was to strengthen scientific research in order to gain insight into factors that determine the functioning of the elderly. In contrast to earlier traditions NESTOR employed a top-down approach (a bottum up approach seldom leads to adequate concentration and coordination) and stimulated inter- or multidisciplinary studies.

Three clusters of topics have been distinguished within the NESTOR framework:

1. The social and economic functioning of the elderly, with two subthemes: 1.a) Income development, and 1.b) Living situations and networks.
2. Threatened functioning, with two subthemes: 2.a) Determinants of the need for care, and 2.b) Determinants of illness and malfunctioning.
3. Possibilities for intervention, with two subthemes 3.a) Cognition and compensation, and 3.b) Clinical geriatrics.

In addition a fourth cluster focusing on support and general activities, including the development of scales and measurement instruments, the identification of and continuous care for a sample for longitudinal research, and the infrastructure needed for longitudinal research.

To each of these clusters a little less than 4 Million Dfl was allocated. The total of 15 M.Dfl turned out to be only 30% of the total amount spent for NESTOR research. The rest was granted through the universities (48%) and other sources or grants (22%).

Two of the themes within the NESTOR programme are of importance for the theme of the Conference (Ageing of the Workforce):

1. The economic aspects of ageing: a research project on the determinants of retirement behaviour and data collection, carried out by the Centre for Economic Research on Retirement and Ageing (CERRA), at Leiden University. The research was primarily

focused on the relative importance of determinants of retirement behaviour like the role of financial incentives (wages, social security, early retirement benefits), health, job characteristics and social environment.

2. The Netherlands memory and ageing programme (NMAP), carried out by the Department of Psychiatry & Neuropsychology at the University of Limburg, and the Department of Neuropsychology and Gerontology at the University of Groningen. Several thousands of normal, healthy volunteers aged 20-85 participated in the main project: a large cross sectional study into memory and memory related functions. Cognitive memory strategies, the use of computerized information systems and self assessment of memory functions as well as physiological and clinical chemical determinants of cognitive deterioration were studied.

At this moment the NESTOR programme is finished and its results have been evaluated. It was felt by the evaluation committee that the programme had contributed significantly to the systematic study of this important field and it was recommended that the programme as such (with the necessary adaptations and adjustments) should be continued with support of the Dutch National Research Council. The latter has taken up the challenge and initiated the programme "Successful ageing", to be started in 1999.

Two other Dutch developments should be mentioned: In the first place the initiative to set up research in gerontechnology (an initiative of the Technical University Eindhoven and the Institute for Perception Research (IPO) in Eindhoven). Psychogerontology is the multi-disciplinary study of the interface between technology and ageing in order to make possible an optimal functioning of the elder people in every day practice. Emphasis will be put on: Communication, Living and Housing, Mobility, Health, and Work (effective training opportunities, adapting technical systems, etc.) Secretary of the "International Society for Gerontechnology is Dr. Jan Graafmans, TU Eindhoven, the Netherlands.

Secondly the initiative to start a cross European longitudinal study of ageing, with financial support of the European Commission (Schroots J.J.F, Fernandez-Ballestreros R, Rudinger G. (1998) Ageing in Europe: From EUGeron to Excelsa. Amsterdam :IOS Press).

Reference:

1. Five years NESTOR: a progress report on The Netherlands. Programme for Research on Ageing/ (ed. NESTOR). - Utrecht: Netherlands, Institute of Gerontology (NIG).

2. Learning and competence development

2.1 Age, competence and learning at work.

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Summary: Eight key questions.

1. Are older workers less good than younger ones?
   On average, older workers are as effective as younger ones. They are often rated as better, although age-decrements have been found in some settings. There are wide variations between jobs and people, but older staff tend to be more consistent, cautious, slow and conscientious. No differences are likely in overall absenteeism, older staff have fewer accidents, and they are less likely to leave the organisation. Their average net cost to an employer is likely to be similar to that of younger staff.

2. Why might one expect older workers to be less good?
   Social stereotypes and personal experience of oneself or other people suggest the possibility that mental decrements occur with age. There is also considerable evidence from laboratory research that in demanding cognitive tasks older individuals process information less effectively than younger ones. Decrements in working memory and processing speed appear to underlie those differences. However, age-differences are non-existent or small when tasks are relatively simple, supported by cues in the environment, or involve habitual routines.

3. Does not experience help older workers?
   Relevant experience can benefit older workers by generating expertise in a specific area. This has been demonstrated in some types of job activity, in crystallised intelligence and in forms of practical knowledge outside jobs. Expertise gives rise to deeper understanding, greater automatisation of behaviour, and more complex perception of tasks and possible solutions. However, older people's expertise cannot assist in information-processing tasks for which knowledge is unimportant. Furthermore, there are domains of activity in which *younger* individuals are more experienced and expert than older ones.

4. Under what conditions are young-old similarities or differences expected?
   In considering the conditions in which older employees are better than, worse than or equal to younger ones, it is necessary to identify two features: older and younger employees' ability to meet the information-processing demands of a job, and the probability that either older or younger individuals will have more expertise relevant to those demands. On that basis, eight categories of task can be identified. Older people are expected to be worse in four cases, equal in three and better in one. However, the relative prevalence in work settings of the eight types of task is not yet known.

5. Are there age-differences in learning?
   There is clear evidence that older employees are less likely to take part in learning (the source of expertise), and that, when they do take part, they are less effective learners than younger people. Older individuals require more time than younger ones to reach the same learning criterion. On average they also learn less within a specified time, especially when cognitive demands are increased by rapid pacing. Possible causal factors underlying the age-decrement in learning include differences in recent relevant practice, in processing speed, in working memory, in forgetting partly-learned material and in a failure to inhibit perseverative errors.

6. Are there age-differences in the transfer of learning to job situations?
   There is considerable evidence that transfer from training settings into the work-place is problematic at all ages. Transfer is a question of both the retention and the generalisation of learned material, and there are reasons to expect that older employees will exhibit less transfer of both kinds. Poorer retention at older ages is likely because of poorer initial learning, less subsequent consolidation through practice, and greater susceptibility to interference. Poorer generalisation at older ages may arise from the provision of fewer opportunities for application and more restricted organisational support.

7. How can older workers' learning and transfer be increased?
   Deriving from research and practice in the areas of learning and transfer, recommendations can be made to improve the effectiveness of older employees. These are addressed to individuals' motivation, as well as to the creation of a positive learning climate which specifically encourages the development of older staff. In many of the proposals, additional learning time for older people appears desirable. A transfer partnership of managers, trainers and trainees is suggested for the better retention and application of new expertise in job settings.

8. What about non-cognitive features?
   Most research has investigated cognitive features of information-processing ability and relevant expertise. However, job performance is also determined by non-cognitive aspects of personality, motivation and interests. Some age-differences have been found in particular traits of personality, and differences in motivation and specific interests appear extremely likely. Deeper understanding of age and job performance requires a shift of research attention to consider also these non-cognitive features.

Any definition of the age at which people become "older workers" is necessarily arbitrary, but most commentators suggest that it is somewhere between 40 and 50 years. Looking across research carried out in work settings and in the laboratory, the pattern of age-differences which are positive, negative and neutral is becoming clear, but knowledge remains limited in several respects. This review will be organised around eight interrelated questions, and a summary answer will be provided at the end of each section.

Are older workers less good than younger ones?

Linked to undoubted widespread prejudice against older people in the labour market is a common belief that they tend to be less good at their jobs than younger people. However, research findings point clearly to the contrary: across jobs as a whole there is no significant difference between the job performance of older and younger workers. The average correlation coefficient from more than 100 investigations is about +.06 (McEvoy, Cascio, 1989; Warr, 1994a).

Table 1. Age and employee output in five studies.

	Under 25	25-34	35-44	45-54	55 and above
1. Skilled manufacturing operators (USA)	77	85	100	106	106
2. Semi-skilled assembly workers (USA)	89	87	100	105	101
3. Mail sorters (USA)	101	102	100	101	99
4. Office workers (USA)	92	99	100	99	98
5. Manufacturing machine operators (USA)	96	100	100	97	94

Sources: 1) Giniger, Dispenzieri, Eisenberg, 1983. 2) Schwab, Heneman, 1977a.
3) Walker, 1964. 4) Mark, 1957. 5) Kutscher, Walker, 1960.

The large majority of studies have assessed performance through supervisors' ratings of specific competences or of overall effectiveness. In most cases results are presented only as simple correlation coefficients, so that we cannot identify the pattern of scores across different ages (is the age-curve linear or non-linear?). However, some published results about actual job performance (rather than ratings) at different ages have been brought together in Table 1.

Standardizing the scores around those for workers aged between 35 and 44, it can be seen that in these studies there is generally an increase in output up to that age-range, and then either a continuing increase, a plateau, or a small decline. There is also some evidence from correlational analyses that up to middle age older workers' job performance is typically better than younger ones; in samples of young employees (average age below 26 years), the average correlation between age and job performance was found to be significantly positive (+.16; McEvoy, Cascio, 1989)[1].

A decline in creativity from the fourth decade has generally been reported when the achievements of scientists, artists, philosophers and other scholars are examined. A common finding is an upward trend followed by a small decrement in later years (Horner, Rushton, Vernon, 1986; Simonton, 1988). However, there are marked variations between different areas of work. For example, contributors to the arts (defined as chamber musicians, dramatists, librettists, novelists, opera composers and poets) appear to peak in their 40s and then rapidly become less creative, whereas scholars (historians, philosophers, etc.) remain equally impactful between their 30s and 70s (Simonton, 1994, chapter 7).

Average age-curves by definition only represent general trends, and it is clear that large differences exist between individual people at any age. These between-person differences tend to be greater in older groups, at least in respect of cognitive (mental) performance (Fozard, Vercruyssen, Reynolds, Hancock, Quilter, 1994; Morse, 1993) and employees' own ratings of how well they are able to work in general (Ilmarinen, Tuomi, Klockars, 1997). It certainly does not follow from a general age-pattern that everyone's performance follows exactly the average trend. For instance, in cases where the average pattern is negative (older staff are in general less effective), some older people are likely to be at least as good as the average young person.

[1] Note that the distribution of ages in a study sample is often poorly described in published accounts. In some cases, a sample may contain only few older employees, although this restriction may not be apparent from the presentation.

A general problem of interpretation comes from the fact that studies of age and job performance have typically been cross-sectional, comparing at one point in time people of different ages who are working in the same job. Although a negative correlation might be observed in a particular setting, this says nothing about how people change across time. Differential exit from or entry into a sample might have influenced the pattern which is observed at any one moment. *Differential exit* would be important when, for example, the more effective individuals have advanced to senior positions, leaving in the older sub-sample of a cross-sectional study only people who are relatively less competent (whereas the younger sub-sample contains a wider range of competence). Alternatively, an older age-group might include only those individuals who have remained in the job because they are more effective and can cope with its high demands. *Differential entry* into the employee group would influence a cross-sectional pattern if recruitment criteria have been made more (or less) stringent in recent years. Research publications have failed to provide information about selective exit from or entry into a study sample at different ages, so one cannot be sure about the nature of changes across earlier years on the basis only of cross-sectional comparisons. However, in purely descriptive terms (what age-pattern is in fact found in a given job?), cross-sectional comparisons are of course valuable.

In order to understand changes across time, longitudinal investigations are needed, charting the performance of individuals as they pass through several decades. Those are extremely rare in work settings. In a study of research chemists across more than 25 years, Stewart and Sparks (1966) found that productivity increased steadily throughout individuals' careers. Examining a cohort of academic mathematicians across 25 years, Cole (1979) found that average publication rate remained stable for the sample as a whole. That was the case despite the movement of some individuals into non-mathematical jobs, so that the remainder must have produced more in later years. No other longitudinal studies of job performance appear to have been published[2].

The existence of wide variations between different jobs is not in doubt. Sometimes older workers are found to be less effective than younger ones, and sometimes they are definitely better. In statistical terms, separate correlations between age and performance range from -.44 to +.66 (McEvoy, Cascio, 1989). Three recent illustrations are as follows. Among operatives aged between 19 and 62 in a meat-packing plant, the correlation between age and rated performance was almost zero (.07) (Schwoerer, May, 1996). For sales representatives aged between 21 and 62 that value was +.34: older people were better (Liden, Stilwell, Ferris, 1996). And for hospital nurses between 21 and 61 years, the correlation of age with supervisors' ratings of overall performance was -.22: older nurses were considered to be less good (Ferris, Yates, Gilmore, Rowland, 1985).

Can the presence of either positive or negative associations with age in specific studies be linked to performance in different kinds of work? Unfortunately not directly, because most research reports lack sufficient information about the tasks involved (and also about the stability or otherwise of personnel selection criteria over the study period, and about possible selective migration into and out of the sample at different ages; see above). A conceptual, rather than empirical, approach appears to be necessary; this will be attempted later (Question Four).

When studies have examined specific aspects of job behaviour (rather than the overall indicators which are usual in research summarised above), some regularities become apparent. It is typically found that older workers are more consistent in their performance than younger ones. For example, Walker (1964) observed in a study of mail sorters a steady increase in

[2] Although longitudinal studies are desirable, they still leave unclear the effect of differential exit if they are based only on individuals who are present for the entire period. Those people may be different from the ones who have dropped out, so we need to know also who left at what point and how they had been performing. No such information has been reported in occupational research.

consistency, with less within-person variation in output from week to week, across groups from under 25 to more than 60 years; the oldest group was 60% more consistent than the youngest group. Shoe-leather cutters (in the pre-machine era) were found by De la Mare, Shepherd (1958) to work more slowly at older ages, but older employees produced work of a higher quality, at least up to age 60. Bowers (1952) reported more positive appraisals of conscientiousness and attendance for older workers, in a sample where ages extended into the late-60s. Bird (1969) observed that bosses' ratings of supervisors' change initiative were significantly lower for older staff than for younger ones ($\underline{r} = -.42$).

Some research has examined "prosocial" activity at work, otherwise referred to as "organisational citizenship behaviour" or "contextual performance" (outside a prescribed main task). It is possible that older workers particularly exhibit behaviours of those kinds. Smith, Organ, Near (1983) measured "generalised compliance" in terms of punctuality, use of time and regular attendance, finding a significant positive correlation between employee age and supervisors' ratings of compliance. Older workers may act in other contextual roles of value to an organisation, helping to resolve interpersonal conflicts, providing advice to colleagues or serving as role models for younger workers; however, age-patterns in these respects have not been systematically studied.

In terms of absence, accidents and staff turnover, the research evidence is as follows. Although *absence* because of sickness is often found to be greater at older ages, the opposite is the case for "voluntary" absence, when people take time off work without medical or organizational approval (Martocchio, 1989; Hackett, 1990). The overall age-pattern of absenteeism thus depends on the mix of those effects in a particular organization, and in many cases there is either no overall age difference or younger employees are absent more often than older ones. *Accidents* at work are more common at younger ages, especially among inexperienced staff, although older peoples' fewer accidents may be more serious (Dillingham 1981; Laflamme, Menckel, 1995; Laflamme, Menckel, Strömberg, 1997; Van Zelst, 1954). In some cases, a flat U-shaped pattern is found; for example, vehicle-driving accidents are more common below the age of 25 and above 65, with little variation in between (Massey, Campbell, 1993). There are however limitations in many studies of accidents, since it is difficult to control for possible variations in employees' exposure to risky situations (e.g., Laflamme, Blank, 1996). In respect of *staff turnover*, older people are less likely to leave their employer voluntarily (e.g., Doering, Rhodes, Schuster, 1983), partly because they tend to be relatively unattractive on the labour market.

Three studies have examined a range of job behaviours in conjunction with financial indicators to determine the overall outcome of employing older staff. One American hotel group was unable to recruit enough younger people to handle reservations enquiries by telephone, and decided to appoint above the ages which previously had been usual. Productivity comparisons were subsequently made between reservations agents aged below 50 and those aged 50 and above. It was found that at first older staff had difficulties in training sessions, but problems were overcome by modifying traditional procedures, and an early difference in training time was removed. Older agents were shown to be substantially less likely to leave the company, with considerable savings in recruitment and initial training costs. In terms of wage, health and pension expenditure, the typical older worker was found to cost annually about nine percent less than the average younger one, principally because of lower turnover rates and resulting savings on the recruitment and initial training of new staff. In terms of productivity, older staff were slower (with telephone conversations being somewhat longer) but equally likely to arrange a reservation. It was concluded that "hiring older workers was a success" and that "the net cost of employing older workers was nearly identical to the net cost of employing younger workers" (McNaught, Barth, 1992, p. 60).

Billings (1983) also examined a single American company, finding that costs associated with staff turnover and absence were greater at younger ages, but that health insurance costs

(primarily linked to claims for employees' dependants) were greatest between 45 and 54 years of age. That form of company expenditure is not found in Europe, and overall expenditure on older employees will often be less than that of younger ones.

A British "do-it-yourself" retail store adopted the policy of employing only staff over 50 years old, aiming to ease recruitment difficulties and reduce high staff turnover. An analysis of the outcomes of this change concluded that "gains in terms of reduced turnover, absenteeism, product knowledge and customer care have been obtained with no adverse effect on profitability" (Hogarth, Barth, 1991, p. 16). Training time was initially extended, but that requirement was subsequently removed. Ill-health at older ages was not a problem, primarily since more healthy individuals tended to self-select themselves into the work. Although the older employees at first appeared hesitant about using new technology, after practice no age-differences were present. There was however a trend for older workers to aim for higher quality, with a slight reduction in their pace of work.

Summary answer to Question One: On average, older workers are as effective as younger ones. They are often rated as better, although age-decrements have been found in some settings. There are wide variations between jobs and people, but older staff tend to be more consistent, cautious, slow and conscientious. No differences are likely in overall absenteeism, older staff have fewer accidents, and they are less likely to leave the organisation. Their average net cost to an employer is likely to be similar to that of younger staff.

Why might one expect older workers to be less good?

In the light of research evidence that older individuals are on average as effective in their jobs as younger ones, why is it widely expected that they are not? Expectations of a decline with age appear to derive from two sources: everyday experience, and controlled investigations of people's ability to process information at different ages.

In everyday life it is obvious that physical bodies and mechanisms gradually wear out with continued use over long periods. Some remedial actions are possible, but the dominant expectation is one of gradual decline; a motor car performs very well when new, but problems arise after a period of years. That expectation is often extended from *physical* decline to presume that the same deterioration will occur in mental structures, as though psychological equipment also wears out. There is clear evidence that it can indeed wear out in very old age, but in many cases expectations about decline in middle age have no basis in reality. Certainly, some people claim to see early signs of mental decline in themselves or others, for instance particularly in their ability to remember people's names (e.g., Cohen, Faulkner, 1986; Jones, Rabbitt, 1994)[3]. However, complaints about one's memory have been found to be more associated with general depressed mood than with actual performance on objective memory tasks (Smith, Petersen, Ivnik, Malec, Tangalos, 1996), and the validity of self-reports about mental processing has not been established.

Individual's belief that increasing age is associated with mental as well as bodily decline is encouraged by the widespread dissemination in society of negative stereotypes about older people (Kite, Johnson, 1988). Exaggerated age-linked problems are communicated through the media as well as in personal conversations, and a person's own views and those promulgated in society work together to sustain general stereotypes about ageing and older people. It should be noted that these stereotypes may contain some truth at the level of the

[3] Recalling people's names is specially problematic because they have few connections in semantic mental networks. In addition, verbal circumlocutions are not possible if one cannot recall a person's name, whereas alternative forms of words are often available in the case of objects or events. Note that the issue is one of a temporary failure in the ability to retrieve information (rather than its permanent loss from memory), since "forgotten" names are usually open to recall at other times.

population as a whole; their damage is caused by over-general application to all cases, rather than judging each individual in terms of his or her own personal characteristics. Inappropriate application of stereotypes (resulting in prejudiced decisions) may be specially likely when decisions about older staff are taken by younger people, since attitudes to age have been found to be more negative in younger adults than among older ones (Finkelstein, Burke, Raju, 1995; Warr, Pennington, 1993)[4]. Furthermore, younger people's views about ageing and older individuals tend to be relatively simple and undifferentiated (Hess, 1994).

Despite the exaggerating impact of negative age-stereotypes, the widespread expectation that older people are in certain ways not as competent as younger ones derives scientific support from the results of many controlled investigations. These have examined activities which may be grouped under the general heading of "information-processing" -- how people handle information which requires them to think about and produce some kind of response (solving an abstract problem, picking out a salient theme, integrating different concepts, responding quickly to a complex pattern, etc.). Hundreds of studies have demonstrated that older people are less effective than younger ones in some aspects of complex information-processing.

A general indicator is in terms of measures of "fluid" intelligence, covering abilities such as seeing relationships among patterns, drawing inferences from relationships, and understanding implications between different elements. It has long been established that older people in the working population (and of course beyond that) perform less well on tests of fluid intelligence than do their younger counterparts (e.g. Salthouse, 1991a; Warr, 1994a). The effects are not great on average, and their implication for job performance is not fully clear, but they are consistently found. Most investigations have been cross-sectional, and "longitudinal age changes are generally less pronounced than the cross-sectional data for most variables, with modest decline beginning in the early 60s and marked decline not occurring until the 80s" (Schaie, 1996, p.135).

Another set of studies has examined performance on problem-solving tasks, such as those involved in concept formation, logical reasoning, the solution of anagrams and twenty-question games. Cross-sectional decrements are commonly found in such studies (Charness, 1985; Verhaeghen, Salthouse, 1997).

More specific information-processing activities include selective attention, inhibition of extraneous stimuli, memory for previously experienced material, the use of working memory, divided attention, and speeded reactions to information presented. In complex forms of all of these, older individuals tend to be cognitively less effective.

Selective attention occurs when people have to direct their limited mental resources toward particular targets, in the presence of other stimuli which can instead capture some of that attention. An age-difference has long been observed in this process (Rabbitt, 1965). In general, it appears that older individuals may be more distractible, being less able to suppress task-irrelevant information while seeking to identify needed material (Hasher, Stolzfus, Zacks, Rypma, 1991). Information-selection occurs both at the time of encoding, when material is being received for processing, and also during retrieval, when items have to be located from among others (which need to be "inhibited") in a memory store (Hasher, Zacks, 1988). A related form of inhibition is in the suppression of previously-established automatic responses in situations where those are no longer appropriate; that form of inhibition appears also to be more difficult at older ages (Dulaney, Rogers, 1994).

A large number of investigations have examined tasks in which people of different ages are asked to remember material which has been presented to them previously. Cross-sectional age-decrements in memory are typically found (Kausler, 1994). For example, in a meta-analysis of earlier studies Verhaeghen, Salthouse (1997) reported an average correlation

[4] The fact that attitudes to age are more positive among older people suggests that an organisation's clients (who may be relatively old at the present time) are often likely to value being served by older staff.

between age and this form of ("episodic") memory of -.33. The age decrement occurs across a wide range of memory tasks, but differences are reduced when the to-be-remembered material is organised rather than comprising disconnected items (Verhaegen, Marcoen, Goossens, 1993).

Particular problems are faced by older people in mental processing which involves "working memory", carrying out operations on one set of material while other information is held in temporary storage (one's working memory) before being brought back into active processing. For instance, in a laboratory investigation people might be presented with a list of words to keep in mind, then asked to carry out a task of logical reasoning about different material, before trying to recall the initial list of words. Older individuals have often been shown to be less effective in working memory tasks than younger people (Craik, Jennings, 1992); for instance, the correlation with age was -.36 in the meta-analysis by Verhaeghen, Salthouse (1997).

Other laboratory research has examined "dual-task" activities, in which people have to carry out two sets of mental operations at the same time. These involve divided attention, as a person shifts mental focus from one to the other task, and also working memory, as he or she holds in mind features of one task while working on the other one. Significant age-decrements have consistently been found in dual-task processing (Kramer, Larish, 1996).

Working memory is widely involved in complicated mental processes, as different elements are manipulated and held in store before a conclusion is reached. It appears that the age-decrement in this activity can account for many other processing differences between older and younger people. For example, Salthouse (1991a) studied performance on several reasoning tasks as a function of age (between 20 and 84 years). Measures were also taken of each person's working memory effectiveness, and those were found (in hierarchical regression analyses) to substantially account for the age-decrement in reasoning itself. It appears that age-decrements in reasoning derive largely from decrements in working memory.

Older people's poorer information-processing of many kinds is also associated with a general cognitive slowing (Myerson, Hale, Wagstaff, Poon, Smith, 1990; Smith, Brewer, 1995; Welford, 1985); the correlation between age and processing speed was -.52 in the meta-analysis of Verhaeghen, Salthouse (1997). Slower reactions may sometimes be problematic in their own right, but they can also have a more general effect, degrading mental activities which superficially do not seem to demand rapid processing. Mental capacity is limited, and there is a need to pass information through the system rapidly before it is lost or overtaken by other material. Slower processing will lead to greater information-loss as one mental activity follows another, especially in complex, sequential operations. Mental performance "almost always consists of successions of stimuli and responses, with the observed results of each response affecting the stimuli for subsequent ones, so that the whole chain functions as a continuous, co-ordinated system" (Welford, 1985, p. 334); even small failures early in such a system necessarily lead to deficits in later performance.

Several researchers have examined whether older people's slower mental processing underlies their poorer working memory as well as their lower cognitive effectiveness of other kinds. Perhaps cognitive performance declines somewhat at older ages because operations cannot be executed within the necessary time and because the products of earlier activity are no longer available (having been lost because of a previous too-slow operation). Salthouse (1991b, 1993a, 1996) has demonstrated that this is often the case. Across a wide range of mental tasks, slower information-processing at older ages was found (in hierarchical regression analyses) to contribute to poorer performance at older ages. This was seen in reasoning, memory, mental manipulation, pattern comparison, copying, arithmetic and other tasks, arising presumably from some (as yet unspecified) neurophysiological decrements with age. In respect of working memory itself, Fisk, Warr (1996) have shown that age-decrements are closely linked to the slower processing speed of older individuals.

How early do these cognitive decrements become apparent? Many investigations into ageing have examined people in their 70s and 80s, and it might be thought that a pattern observed across those later years will not be present within the working population. In fact, cross-sectional decrements are often found in samples below 65 years (Salthouse, 1985, Table 1), although they are not as great as those present across later decades. Verhaegen, Salthouse (1997) compared the age-patterns observed for younger and older groups, finding that "although it is true that the influences related to age are stronger after the age of 50, they are clearly different from zero in the range from 18 to 50 years" (p. 245); the observed decline accelerates (cross-sectionally) over the life-span.

It is important to emphasise that the poorer and slower mental processing observed at older ages is only found when tasks are complex, placing considerable demands upon a person. It has frequently been found that age-differences are greater when psychological resources are more strongly challenged. Greater task difficulty arises from substantial speed demands and/or from the need to progress through many successive mental operations, drawing repeatedly upon working memory. Very complicated tasks, requiring a large number of processing steps, are particularly likely to be affected by cognitive slowing (Myerson et al., 1990). In the many other cases where cognitive processes are not greatly challenged, age-differences are not found or are substantially smaller than in the published accounts of age-deterioration (Craik, Jacoby, 1996; Craik, Jennings, 1992).

Age-decrements are also smaller when difficult cognitive processes can be supported by environmental cues. Although much mental activity is conducted entirely through *internal* manipulation and reorganisation, some cognitive processes can receive assistance from the environment. For example, recognising something from a list of alternatives requires less mental initiation than recalling it through internally-generated searches of all relevant elements in one's memory. Associated with that difference, recognition shows a smaller cross-sectional decrement than recall (Craik, Jennings, 1992; Kausler, 1994; Schugens, Daum, Spindler, Birbaumer, 1997; Wilkniss, Jones, Korol, Gold, Manning, 1997) and no longitudinal decline over 16 years (Zelinski, Burnight, 1997). When environmental cues are available (as in menus on a computer screen or elsewhere, recall suggestions at appropriate locations, or personal lists of reminders), age-differences are less likely than when all processing has to be carried out entirely "in the head".

A related issue is the extent to which information-processing permits passive transmission of information, without a need to use working memory, or the active initiation of new processes. Age-differences in straightforward transmission activities are less marked than in the cases illustrated above. For instance, for studies of short-term "primary" memory, when material has to be repeated soon after presentation with no intervening mental manipulation, the age-decrement was found in the meta-analysis of Verhaegen, Salthouse (1997) to be smaller than in other activities ($r = -.19$, across the age-range from 18 to the 80s).

Older and younger people also seem to be similar in their "implicit learning", where knowledge is acquired unconsciously in the course of other activities. For instance, in a laboratory study one might examine how quickly individuals respond to material previously presented for completely different purposes, relative to their speed of response to material not previously presented. Despite the fact that people do not expect further exposure to the original material, reaction time is typically faster to the previously "primed" items than to new material, and age-differences are either non-existent or small (Cherry, Stadler, 1995; Craik, Jacoby, 1996; Hashtroudi, Chrosniak, Schwarz, 1991; La Voie, Light, 1994; Nyberg, Bäckman, Erngrund, Olofsson, Nilsson, 1996). There is thus evidence that older individuals may equally recognise as familiar previously experienced material, even though they may be less effective in explicitly recalling that material.

One possible overall interpretation is that age decrements in memory occur primarily when effortful, elaborate processing is required at both the time of encoding and also at retrieval.

When mental processing is less demanding at one or both of those points (because the task is simpler, more automatised, or more supported by the environment), age-decrements are reduced or absent (Olofsson, Bäckman, 1996). Craik, Jacoby (1996, p. 113) concluded that "age differences are smallest when processes are driven automatically by the stimulus or supported by the environment, that is, in cases in which the stimulus is strongly linked to the appropriate response, either by "wired in" functions or because the response is habitual. Age differences are greatest, on the other hand, when processes must be self-initiated in a consciously controlled manner and when a different attentional set from that induced by habit, or by a specific environment, must be established."

Summary answer to Question Two: Social stereotypes and personal experience of oneself or other people suggest the possibility that mental decrements occur with age. There is also considerable evidence from laboratory research that in demanding cognitive tasks older individuals process information less effectively than younger ones. Decrements in working memory and processing speed appear to underlie those differences. However, age-differences are non-existent or small when tasks are relatively simple, supported by cues in the environment, or involve habitual routines.

Does not experience help older workers?

Despite the weight of evidence and supposition that older people are not as effective as younger ones in difficult information-processing tasks (Question Two), it seems likely that they have often gained advantages over the years. We should thus consider possible effects of *experience* (practising a task over a period of time) and its outcome *expertise* (declarative or procedural knowledge, sometimes viewed as "wisdom"). In practice, there have been no longitudinal studies of job-related expertise, and it has been usual to look instead at experience in terms of years of job tenure (in effect, an input of time rather than an output of specific competence).

Previous relevant experience has been shown to be significantly associated with job performance by Avolio, Waldman, McDaniel (1990), Jacobs, Hofman, Kriska (1990) and Schmidt, Hunter, Outerbridge, Goff (1988); Schmidt and colleagues reported a significant positive link between years of experience and level of job knowledge. A meta-analysis of previous studies by McDaniel, Schmidt, Hunter (1988) yielded an average estimated population correlation of 21 between relevant experience and work performance. Given that older employees typically have greater experience than younger ones, it is likely that, when positive associations are found between age and job performance, these will be mediated by amount of experience. That was found to be the case by Schwab, Heneman (1977) and Giniger, Dispenzieri, Eisenberg (1983); positive age-performance correlations (median = +.29) became non-significant (median = +.02) after statistical control for years of experience. (Note that the importance of relevant experience is likely to be non-linear, affecting job performance primarily in the first few years of tenure; Jacobs et al., 1990; McDaniel et al., 1988; Schmidt et al., 1988.)

Maher (1955) found in a study of sales staff that older employees were rated much more positively than younger ones in almost every respect. In terms of product knowledge, the correlation with age was as high as +.59. That positive association is surprisingly strong, until you read that "since the company carries over 1,000 items in its catalogue, a man may require many years to know the technical characteristics of the majority of them" (p. 451). Increased age and time-in-the-job are clearly very helpful in this respect. The value of experience in enhancing social knowledge and interpersonal skills was particularly emphasized by Perlmutter, Kaplan, Nyquist (1990). In their study of food-service employees between 20 and 69, age was found to be correlated +.36 with performance effectiveness.

More precise evidence about the possible value of experience can be obtained from laboratory and psychometric investigations. Two types of activity may be suggested to assist

older individuals, for example in compensating for processing decrements of the kind illustrated earlier (Bäckman, Dixon, 1992; Salthouse, 1987; Warr, 1994a):

- the acquisition of expertise
- behavioural accommodation.

One aspect of the first of these is seen in the specific form of expertise measured through tests of "crystallised intelligence", a person's knowledge of vocabulary and his or her ability to understand and manipulate verbal expressions. Crystallised intelligence is typically found to be greater among older samples. For example, Stankov (1988) reported a correlation of crystallised intelligence with age of +.27 between the ages of 20 and 70 (compared to a value of -.31 for fluid intelligence, above). Other examples are cited by Warr (1994a).

Expertise is of course acquired much more widely than merely in terms of vocabulary as assessed by tests of crystallised intelligence. Horn and Hofer (1992) viewed this in terms of "acculturation knowledge, measured in tasks indicating breadth and depth of the knowledge of the dominant culture" (p. 56). Several investigators have devised measures of practical knowledge about issues in daily life, showing that older individuals typically score more highly than younger ones (e.g., Cornelius, Caspi, 1987; Denney, 1989). Baltes P.R (e.g., 1990, 1991) has developed this point into a general model of "wisdom", emphasising that wisdom is acquired through experience across many years. Wisdom is viewed in this model as "a highly developed body of factual and procedural knowledge and judgement" (Baltes P.R., Smith, 1989, p. 87).

Wisdom may be applicable to a wide range of interpersonal issues in everyday life, but it often has a more narrow focus, being limited to a single domain. Specifically job-related expertise has been examined through tests of relevant job knowledge by Hunter (1986) and Borman, White, Pulakos, Oppler (1991). In both cases, job-related expertise was strongly associated with supervisory ratings of performance. From a meta-analysis of previous studies, Dye, Reck, McDaniel (1993) obtained an average (uncorrected) correlation of 22 between job-knowledge test score and job performance. (For success in training the uncorrected value was 27). It is to be expected that older employees will on average have greater job expertise as a result of their greater experience in a job, but age-patterns were not examined by the researchers cited.

In general, however, the problem-solving performance of older people is expected to equal or exceed that of younger ones because they have acquired expertise (or "acculturation knowledge" or "wisdom") through extended practice and exposure to new situations. Some evidence is available from non-occupational research. For instance, Maylor (1994) examined performance in a television quiz show demanding substantial general knowledge; age (between 25 and 79) was correlated positively (+.29) with performance. Rabbitt (1991) studied the competence of experts and novices in the completion of crossword puzzles. The experts' performance (following years of experience) was unrelated to their age (between 55 and 75), whereas the success of novices declined across that range of years. Salthouse (1993b) found that older (median age = 72) people's performance on complex verbal tasks was significantly predicted by reported recent experience with word puzzles (median $\underline{r}$ = +.40). Allen, Ashcraft, Weber (1992) showed that highly-educated older individuals (mean age 68 years) were as effective as younger ones in much-practised tasks of mental arithmetic (although they were significantly slower). Dixon, Kurzman, Friesen (1993) reported that handwriting performance was significantly slower for older adults than younger ones (mean ages 21 and 69), but that an interaction with familiarity was present: older writers' performance was relatively more slow on unfamiliar tasks (such as copying backward "h") than on familiar ones (e.g., copying words). In the terms used here, older people's expertise relevant to the task reduced the age-decrement which occurred.

Other comparisons between the performance of novices and experts have distinguished between "declarative" and "procedural" knowledge (e.g., Anderson, 1982). Expertise is accompanied by greater knowledge of both kinds. In the first case, a person acquires information about individual facts and their relationships in different situations. During subsequent learning, this declarative knowledge is gradually converted into a set of behavioural procedures through which it is applied in dealing with the environment. These procedures become collapsed into increasingly long strings of action or thought, which the person can execute as a whole, and which he or she can readily assess for appropriateness and generalizability.

Expertise thus includes greater "automatisation" of behaviour and thinking, as people move from controlled, effortful cognition to execute smooth routines, which are not under direct control once initiated but which free mental resources and permit simultaneous processing of information. This may be viewed as a process of cognitive “compilation”, as activities or thoughts are assembled into higher-order or more automatic chunks, which are relatively independent of (possibly problematic) lower-order procedures. For example, only about one-third of the speed-up with practice that Charness and Campbell (1988) observed in a two-digit mental squaring task was due to faster execution of elementary arithmetic operations; most of the speed-up derived from higher-order learning, in terms of chaining together the sub-goals quickly and efficiently. In addition, experts perceive and recall large meaningful patterns in their domain, made possible by their superior and more organized knowledge-base (Charness, Bosman, 1990), and can more rapidly process new material within their established knowledge-structures (Hess, 1994). These differences occur for motor skills as well as for purely cognitive expertise (e.g., Allard, Starkes, 1991). In general terms, as pointed out in the previous section, more automatic, habitual mental activity (characteristic of expertise) is less liable to an age-decrement than is effortful new activity.

However, research has emphasized that expertise is very much domain-specific; an expert in one area may be ineffective elsewhere. This fact has led to the development of models of “selective optimisation with compensation” (e.g., Baltes M.M, Carstensen, 1996; Baltes P.R, 1990, 1991), primarily applicable to ages beyond the work-force but also relevant to younger people. “Selective” refers to older people’s restriction of activity to fewer domains; “optimisation” covers behaviours which can maintain and improve expertise; and “compensation” involves procedures to counteract the declines which might occur in processing activities (Question Two, above).

Possible compensation at older ages was illustrated in a study by Salthouse (1984) of typists aged between 19 and 72. Although older typists were clearly slower in separate measurements of response speed, they were able to type as fast as younger ones. It turned out that older typists achieved this by means of looking in advance further ahead along the line to be typed, so that they were processing at any one time longer chunks of material than were younger typists. That greater anticipation permitted older people to compensate for declining perceptual-motor speed by beginning keystroke preparation earlier. This difference in previewing was later confirmed by Bosman (1993); see also Salthouse, Saults (1987) and Marquié, Paumes (1988).

In research into the comprehension of prose material, Dixon, Bäckman (1992) have argued that older people can compensate for other deficiencies through a greater skill in interpreting metaphors. Studies of chess-players have shown how expertise can counteract processing limitations. Charness (e.g., 1989) points out that chess-playing depends heavily on the ability to think ahead, which in turn makes continuing demands on working memory. As expected from research reviewed above, many older people have poorer memory for individual chess positions than younger ones (controlling for level of expertise). On the other hand, experienced older players were found to be equally good at choosing the best moves from given positions. They could appreciate configurations of individual locations, tended to search

less widely (despite looking ahead to the same extent), and from that more economical (and more rapid) procedure they were as effective as younger players, despite some memory deficits with age (see also Ericsson, Smith, 1991).

However, it appears that, in cases where information-processing is entirely abstract or demanding of highly speeded responses, previous experience is unlikely to provide much assistance (because the knowledge-based expertise acquired does not map onto the processing task in question). Several studies have shown that apparently relevant professional experience (e.g., as an architect) or experimentally-provided experience do not improve the effectiveness of spatial visualisation (where different shapes have to be mentally compared or manipulated) (Lindenberger, Kliegl, Baltes, 1992; Salthouse, 1991c; Salthouse, Babcock, Skovronek, Mitchell, Palmon, 1990; Salthouse, Mitchell, 1990). As the authors point out, the visualisation tasks examined in these studies explicitly exclude the application of knowledge, so knowledge-based expertise cannot be of use.

The benefits of expertise are thus likely to be seen only when its content (in declarative or procedural knowledge) is directly relevant to the task under examination. Despite the general deficiency of older people relative to younger people in difficult abstract tasks studied in the laboratory (for which acquired knowledge provides no advantage), they may be as good as or better than their younger counterparts in cases where they have gained expertise whose knowledge content is relevant to the task in hand. However, in cases when older individuals do not possess more knowledge which is relevant to the task in hand, younger people's better working memory and faster information-processing are likely to result in the age-decrement typically reported for complex cognitive tasks.

A second form of potential compensation deriving from experience is behavioural accommodation, in which a person alters his or her activities. This is sometimes seen in the investment of more time or effort to make up for perceived deficiencies. Experience brings with it a recognition of when additional effort is required to maintain or exceed previous performance levels. Specific effort may be allocated directly to the task in hand, or a person can seek environmental support, for example by obtaining written guidance or making notes to assist recall or future behaviour. Other possible supports include spectacles, calculating machines, or the establishment of fixed routines to ensure that required actions are carried out fluently and reliably. Associated with that, older people often learn how to conserve their resources for specially important activities, managing their overall effectiveness through variations in the use or conservation of resources (Birren, 1969).

In some cases, behavioural accommodation may take the form of asking colleagues for assistance when knowledge or resources are lacking. In other cases, it is seen in an avoidance of situations which might reveal deficiencies. For instance, older employees may to a greater extent select tasks known to be within their capacity, avoiding those which now cause them difficulty. This process is likely sometimes to result from informal decision-making by members of a team, ensuring that more physically taxing roles are filled by younger people and those requiring special expertise are undertaken by older staff. In extreme cases, accommodation can be seen in selective migration of older workers out of jobs which have come to cause them problems (e.g., Teiger, 1989). Although older people tend to move out of work which requires considerable physical effort, migration also occurs away from cognitive activities which are persistently rapidly-paced (Warr, Pennington, 1994).

The discussion in this section has primarily emphasised the ways in which experience (practising a task over a period of time) can provide expertise (declarative or procedural knowledge, perhaps viewed as "wisdom") among individuals who are older. Given that gaining experience requires time, it is of course likely that in general age and experience will be positively correlated. However, there are activities and knowledge domains in which *younger* individuals are likely to be more experienced. This occurs, for instance, in relation to some leisure and musical activities, where older people are often unfamiliar with themes

which are important to younger ones. It is also seen in an understanding of technological developments to which younger cohorts have been more exposed than older ones; for example, at the present time younger employees in general have had more experience of computer-related activity (during their education and spare time) than have older ones in general. In the study by Czaja, Sharit (1993) age was strongly negatively correlated (-.46) with years of computer experience.

There has been little research into the sources and content of specifically job-related expertise at different ages. It seems likely that the development of job knowledge is encouraged by greater effectiveness in information-processing (see Section Eight). Furthermore, the specific consequences of different job-related expertise at different ages require investigation. It is clear in general terms that a greater amount and depth of knowledge will affect how a person thinks about himself or herself and forms impressions of new situations and people (Hess, 1994), but details in job settings are lacking. Increased routinisiation and automaticity, associated with expertise, are known to reduce age-differences in information-processing effectiveness (see Section Two), but other age-related consequences of expertise at work remain largely unexplored. It would be useful to compare the ways in which older and younger holders of the same job approach their tasks; are differences in expertise visible in their work practices?

Summary answer to Question Three: Relevant experience can benefit older workers by generating expertise in a specific area. This has been demonstrated in some types of job activity, in crystallised intelligence and in forms of practical knowledge outside jobs. Expertise gives rise to deeper understanding, greater automatisation of behaviour, and more complex perception of tasks and possible solutions. However, older people's expertise cannot assist in information-processing tasks for which knowledge is unimportant. Furthermore, there are domains of activity in which *younger* individuals are more experienced and expert than older ones.

Under what conditions are young-old similarities or differences expected?

The previous sections have illustrated many different age-patterns in job behaviour and information-processing; the relationship depends on which activity is examined. In general job performance is equally good at all ages below typical retirement age but there are variations between jobs and people, and information-processing effectiveness tends to deteriorate in later years. Relevant expertise, gained through experience across time, can help older employees in many cases, but there are some domains in which younger rather than older people are the more experienced and expert.

Given these multiple and conflicting influences, it is clearly desirable to create an overall framework which can identify possible relationships between age and performance: positive, negative or neutral. One suggestion is in Table 2, which builds upon themes introduced earlier. Eight main types of activity (in a job or elsewhere) are proposed, although in reality the variation is of course continuous rather than in discrete categories as set out here.

The framework is based upon a distinction between those information-processing activities in which older people ("OP" in the table) are less effective than younger ones ("YP") ("OP<YP") and those in which there is no difference between the age-groups ("OP=YP"). As discussed in relation to Question Two, age-decrements in working memory and processing speed are associated with widespread cognitive performance decrements at older ages. Those decrements are more pronounced in complex, effortful mental work and when no environmental support is available. Deterioration is greater after the customary age of retirement, but

Table 2. Age, information-processing effectiveness and expertise: Eight types of activity.

	Pattern of information-processing effectiveness	Can expertise help?	Pattern of relevant expertise	Expected age-pattern	Type of activity
Complex mental activities, perhaps with no environmental support					
1:	OP < YP	No	(n.a.)	OP < YP	Age-impaired
2:	OP < YP	Yes	OP > YP	OP = YP	Age-counteracted
3:	OP < YP	Yes	OP = YP	OP < YP	Age-impaired
4:	OP < YP	Yes	OP < YP	OP < < YP	Greatly age-impaired
Less complex mental activities, perhaps with environmental support					
5:	OP = YP	No	(n.a.)	OP = YP	Age-neutral
6:	OP = YP	Yes	OP > YP	OP >YP	Age-enhanced
7:	OP = YP	Yes	OP = YP	OP = YP	Age-neutral
8:	OP = YP	Yes	OP < YP	OP < YP	Age-impaired

OP: older people
YP: younger people
n.a.: not applicable

may occur to some extent among employed people. These cases, where "OP<YP" in terms of information-processing effectiveness are shown in the first half of the table.

Other cases, of less rapid or less complex mental activity where OP=YP in terms of information-processing effectiveness, are presented in the second half of the table. (No cases of "OP>YP" are included, since more effective basic processing is not found at older ages.) The second column of Table 2 asks whether expertise (declarative and procedural knowledge acquired through practice) can help performance in a particular circumstance. As illustrated above, expertise can be widely helpful, but there are some processing activities which cannot be improved by knowledge-based expertise, even if that appears relevant to the task. Third, we need to ask whether older or younger individuals are more likely to have expertise which is relevant and useful, identified in the table as either "OP>YP", "OP=YP" or "OP<YP". On these bases, activities may be defined as age-impaired, age-counteracted, age-neutral or age-enhanced. Let us consider each of the eight types in turn.

Type-one tasks involve mental activities in which expertise cannot be useful in information-processing. As described above, visual spatialisation is not assisted by knowledge-generating experience in seemingly relevant jobs; and decrements in sensory mechanisms (e.g., vision or hearing) can rarely be improved by knowledge-based expertise. Other tasks in this category include difficult working memory or reaction time activities. As summarised in relation to Question Two, activities of those kinds are to varying extents age-impaired and not open to gains through experience[5]. Most research has focussed on laboratory tasks explicitly designed to be cognitively difficult and undertaken in a very short time, and in the minority of jobs which present such demands age-impairment is likely. However, the magnitude of this impairment in work activities cannot yet be quantified; many effects observed in the laboratory are small, and they have not yet been directly linked to specific job behaviours.

In type-two and type-three activities, older people are again less effective in terms of basic information-processing, but they differ in the balance of their relevant expertise. In cases where OP>YP in expertise, older people's greater knowledge and more sophisticated perspectives in the domain permit some compensation for their limitations; but, when OP=YP in terms of relevant expertise, age-impairment in task performance is again expected. In

[5] People can learn over a long period to speed up their simple reactions to presented stimuli by modifying the way they balance speed or accuracy of response (Rabbitt, 1993), but such effects are too small to be of any practical consequence.

settings where younger people are both more effective at information-processing and more expert (type four), a substantial age-decrement is expected. This is likely to occur during initial work in many computer-based jobs at the present time, since between-cohort differences in education have led to marked age-differences in relevant expertise. More generally, such a pattern is expected in many activities whose technical content is changing rapidly, so that older employees' knowledge becomes outdated at the same time as young people's education provides them with an initial greater expertise (Fossum, Arvey, Paradise and Robbins, 1986).

The other types of activity in Table 2 mirror the first four, but basic information-processing is here equally effective at all ages. That is widely the case in many jobs, where discussions with clients or colleagues are at a relaxed pace, errors can be rectified without difficulty, established routines are followed, individual tasks are quite simple, and work activities are well within the resources of an employee. As a result of the different condition in column one (OP=YP, rather than OP<YP), the expected outcomes are more favourable to older people. Activity types five, six and seven are identified as either age-neutral or age-enhanced, and only in the final case (with greater expertise at younger ages) is age-impairment expected.

The eight-part framework in Table 2 draws attention to the fact that older people are expected to be worse than younger ones in only four conditions: types one, three, four and eight. Of those, types four and eight are unusual cases, where younger individuals in general are more expert than older ones; that age-imbalance undoubtedly occurs, but it is not common. Types one, three and four represent conditions where older people suffer from impaired information-processing effectiveness of the kinds illustrated in Section Two. In some jobs such processing is sufficiently important to suggest that an overall age-decrement in job performance will be found, but in many others task demands do not approach the limits of a person's information-processing capacity. And across all jobs there are wide differences between the capabilities of different employees irrespective of their age.

In seeking overall statements about a job, there is a general need to consider all its key elements. A job is likely to be made up of elements in several of the categories in Table 2. For some elements age-impairment may be expected, but age-enhancement might be envisaged in other components of the same job. A single job may thus fall in more than one of the eight categories. In appraising an age-pattern we need to consider the job as a whole, identifying the principal elements and their relative importance, before attempting to assess the likely overall impact of age upon performance. Only in cases where performance is impaired by age in the majority of key components will an overall evaluation be lower for older workers; in many cases, the *overall* assessment will not be "age-impaired", and in some cases it will be "age-enhanced".

The framework presented here is derived in conceptual terms from empirical considerations summarised in previous sections. It leaves unresolved the location within Table 2 of specific jobs examined in the research literature; published reports typically lack information which would make possible their allocation to one of the eight categories. Furthermore, the relative prevalence of each of the types of activity is unknown; which are more common and which are less common? That presumably varies between different sectors, professions and job levels. There is now a need to obtain information about operation of the two main features in particular employment settings, to examine the empirical usefulness of the framework outlined here.

Summary answer to Question Four: In considering the conditions in which older employees are better than, worse than or equal to younger ones, it is necessary to identify two features: older and younger employees' ability to meet the information-processing demands of a job, and the probability that either older or younger individuals will have more expertise relevant to those demands. On that basis, eight categories of task can be identified. Older

people are expected to be worse in four cases, equal in three and better in one. However, the relative prevalence in work settings of the eight types of task is not yet known.

Are there age-differences in learning?

Given the central importance of expertise in the relative performance of younger and older workers (in six of the eight categories of Table 2), it is clearly essential to examine how expertise may be increased among older members of the workforce. Basic information-processing (the first variable in the table) derives from neuropsychological mechanisms which cannot normally be improved; in order to reduce age-impairment or make still better the work performance of older employees, it is necessary that they acquire new declarative and procedural knowledge.

In considering whether there are age-differences in learning, two issues need to be examined: whether older people *engage in different amounts of learning activity*, and whether they *are differentially successful in the learning which they undertake*.

In respect of participation in learning at different ages, the pattern of findings is clear: older people are relatively inactive as learners. That has been shown for job-related training in work time (Cleveland, Shore, 1992; Department for Education and Employment, 1996; Green, 1993; Straka, 1990; Warr, 1994b) and for voluntary learning in one's own time funded by an employer (Warr, Birdi, 1998). For example, in Britain as a whole less than half as many employees in their 50s are trained in a given period relative to those in their 20s (Department of Employment, 1994), and a similar ratio has been observed for voluntary own-time learning in a large British company (Warr, Birdi, 1998). An age-decrement is also commonly found in respect of adult education in general (not merely among employees) (Courtney, 1992).

The age-difference in participation arises from a number of sources. In respect of individual-level factors, older employees tend to have lower educational qualifications (as standards have increased for later cohorts), so they may lack the underpinning declarative and procedural knowledge which is often essential for new learning. For example, the ability to understand and use information presented as written text or in tables and forms declines steadly (in cross-sectional comparisons) from the mid-twenties to the seventies (Van der Kamp, Veendrick, 1997). The same pattern occurs for numeracy (carrying out arithmetic operations), and a person's initial education level was shown to be the principal predictor of attainment in both literacy and numeracy.

Lower educational qualification is strongly associated with lower confidence about one's ability to acquire new skills and knowledge ($\underline{r} = 40$ in the study by Warr, Birdi, 1998). It is likely that women returning to paid work after a period of child-care particularly lack confidence of this kind, although systematic research information is lacking. There is evidence that recent experience makes more positive people's orientation to training. For example, Nordhaug (1989) asked employees about the outcomes of their most recent training course, and found that 51% reported an increased interest in learning in general, 65% reported more self-actualisation and 42% reported increased self-confidence. A positive feedback cycle between education and favourable learning attitude may thus encourage greater activity among more educated individuals.

Associated with age-related differences in educational qualifications and learning confidence, older workers are generally less motivated to take part in training (Warr, 1994b; Warr, Birdi, 1998). Differences in training motivation (known to be linked to actual participation; Noe, Wilk, 1993) are likely to arise from variations in stable attitudes and interests, as well as in perceptions of oneself and views about possible rewards and costs; many older employees see substantial learning as difficult, unrewarding and not part of their typical life-style. More general attitudes of work-role flexibility (willingness to undertake a range of different job-roles, perhaps requiring new learning) are also less positive at older

ages (Birdi, Allan, Warr, 1997). Age-related norms and differential social pressures at different ages may also influence employees' motivation for training. In many settings it is likely that the support for training provided by a company's policies and by individual managers (Noe, Wilk, 1993; Maurer, Tarulli, 1994) will be greater for younger than for older employees.

Aspects of an organisation's culture thus combine with individual differences in education, confidence and motivation in ways which reduce training and learning activity by older workers. In many settings there may be some collusion betweeen older employees and their bosses. Managers often believe that a better financial return from training will derive from a concentration on younger staff, since they have more years in the company ahead of them. (That expectation is frequently falsified by greater staff turnover at younger ages; see Section One). A corporate culture thus often develops which views training as appropriate only for younger staff, without considering possible learning needs and procedures for their older colleagues. Because of their own lower motivation and confidence, older employees may, explicitly or implicitly, support that norm, avoiding exposure to training activities. The culture of training-only-for-the-young is thus reinforced.

Although older workers are less likely than younger ones to take part in training activities, there is evidence that, when they do take part, their subsequent attitudes are equally favourable (Warr, 1994b; Warr, Birdi, 1998). This is important in relation to the possibility that taking part in learning contributes to a "virtuous cycle": activity leads to greater motivation, which in turn leads to more activity. It seems that such a cycle is equally probable for younger and older individuals; the key practical problem is how to encourage older staff to enter that process initially. (However, research evidence is currently in terms only of retrospective attitudes; there remains a need for longitudinal examination of this question.)[6]

The second issue raised earlier about age and learning was whether older and younger individuals are equally successful in the learning which they undertake. This has been studied both in occupational training settings and in laboratory research, with consistent findings across settings. Kubeck, Delp, Haslett, McDaniel (1996) examined previous research into training, deriving the overall conclusion that older individuals, relative to younger ones, showed less mastery (in post-tests) of training material and took longer to complete the training. The average (uncorrected) correlation between employees' training attainment and age was found to be -.21; for time to complete training, the correlation was 40.

In general, older trainees are less likely to achieve the same learning outcomes in an equivalent time. Few studies have provided unlimited time (which is in any case rarely practicable), but it might be the case that equivalent attainment will be found when no time restrictions are present. That was the case in a laboratory study of programmed instruction (Siemen, 1976), where "each participant was allowed as much time as was needed to complete the program. There was no pressure, except of that self-induced, to complete the material in any specified length of time" (p.186). Post-test scores were almost equivalent for the two groups (mean ages 20 and 73), but the older learners took on average 103 minutes whereas the younger ones finished in an average of 45 minutes.

It follows from the slower learning of older people that, if maximum training time is restricted to that appropriate for younger ones, average learning attainment will be somewhat poorer at older ages. This can occur even in relatively young samples, if training time is short and the task is difficult. For example, age and post-test score were associated -.27 in a study of two-day intensive training for vehicle technicians, despite the fact that their average age was only 31 years (Warr, Allan, Birdi, 1998). Success in air-traffic control training was related on average (across four samples) -.26 to age, in samples with a median age of 27

[6] Another "virtuous cycle" may arise through new learning (yielding greater declarative or procedural knowledge) permitting an employee to shift to more challenging work, which in turn makes increased demands for further learning.

(Trites, Cobb, 1964). In other cases, for example in open learning where individuals can adjust the time allocated to different elements, age may not be linked to poorer outcomes but older learners may report greater learning difficulty, having to adapt to a perceived greater workload by investing greater effort; this was reported by Warr, Bunce (1995).

Most investigations of age-patterns in learning by employees have taken only post-test (attainment) scores, rather than examining the gains made between a pre-test and post-test (Kubeck et al., 1996). Given that post-test attainment can depend upon expertise acquired prior to training as well as on learning gains during a programme itself, it is clearly desirable to obtain both sets of information. This was done by Warr et al. (1998) (age was found to be significantly negatively correlated with learning gain, -.27), and is commonly the case in laboratory investigations of learning. In those studies, material to be learned may be meaningless and new (so that all pre-test scores are effectively zero) or the pattern of change with practice is examined.

Kausler (1994) has summarised a large number of such laboratory studies. The negative age-pattern is found for classical conditioning, operant conditioning, instrumental learning, perceptual learning, paired-associate learning and serial learning. Some of these and other studies are summarised by Warr (1994a); for instance, Thorndike, Bregman, Tilton, Woodyard (1928) demonstrated cross-sectional age-decrements in learners all aged below 45. Age-decrements have also been found in route-learning (Wilkniss et al., 1997), visual-search learning (Rogers, Fisk, Hertzog, 1994) and dual-task learning (Kramer, Larish, 1996). However, although older people require more time, all studies find that they do learn to a significant degree.

The substantial success of older people in learning has been emphasised in a series of studies examining improvements in psychometric and memory test performance. For example, Willis, Schaie (summarised by Schaie, 1994, 1996; Willis, 1989) provided to participants in a multi-decade longitudinal study training in respect of inductive reasoning and spatial orientation (fluid abilities examined throughout the project). Among adults who had previously become worse in those respects (all aged 65 and above), substantial improvements were made through five hours of remedial training, and a significant advantage over controls remained after seven years. Baltes and colleagues have reported similar findings in respect of training in processes of fluid intelligence and memorisation (see Baltes, 1993, for a summary). A meta-analysis of findings about memory-training for people aged between 61 and 78 demonstrated substantial average gains, and moreso when learners were relatively young (Verhaegen, Marcoen, Goossens, 1992). Gains from memory training for people in their 70s were found by Neely, Bäckman (1993) to be maintained for up to three and a half years. However, all these studies of remedial instruction indicate that improvements are limited to activities very similar to those covered by the training (see also Neely, Bäckman, 1995). As in other cases (see Section Three), expertise (newly-acquired or long-established) is domain-specific.

The general thrust of work in this field is that intellectual performance is modifiable, among older adults as well as younger ones. For instance, Charness (1989) has illustrated the potential impact of training by estimating the amount of practice necessary to bring an average older person to the same performance level as that of an average younger adult. Examining published findings for digit-symbol substitution (which is particularly age-sensitive), he concluded that age-effects can be eliminated by allowing three minutes of practice for every year of age-difference. Thus an average 60-year-old can equal an average 20-year-old on this task after three hours of practice.

Recognising that older people can improve on many cognitive tasks through guided practice, why are they generally less effective learners than younger individuals? One interpretation of findings from the remedial memory training studies reviewed above is that decline might be attributed in part to lack of practice in the previous years: disuse may have

caused a decline, both in underpinning knowledge and in awareness of appropriate learning strategies, and that decline may be subsequently reversible through additional knowledge-acquisition. For example, the availability of a knowledge-structure permits more rapid processing of new material (Hess, 1994). In addition, it is clear that the lower processing speed found at older ages contributes significantly to less effective learning (as well as to poorer performance in the other cognitive activities described in Section Two) (Fisk, Warr, 1998; Salthouse, 1993a, 1994).

Salthouse (1994) has demonstrated that older learners are likely rapidly to forget previously-acquired associations during learning, and that this short-term forgetting in the course of a learning task also underlies part of the age-decrement in learning attainment. Fisk, Warr (1998) examined this possibility at different levels of consolidation in memory. They found that, although older people do exhibit a greater degree of short-term forgetting during learning, that difference occurs primarily for associations repeated only infrequently rather than for well-learned associations, for which no age-difference was found. Older people have difficulty in the initial formulation and consolidation of new learning; once established, learned associations are less affected by age. Furthermore, Fisk, Warr (1998) found that older learners were significantly more likely to repeat their previous errors on subsequent trials, as noted much earlier by Kay (1951), Belbin, Downs (1965). Possible causal factors underlying the age-decrement in learning thus include differences in recent relevant practice, in processing speed, in working memory, in forgetting partly-learned material and in a failure to inhibit perseverative errors.

How do learning activities fit within the categories suggested in Table 2? It seems appropriate to place them in types two, three or four, which are presented again for easy reference in Table 3: age-counteracted, age-impaired or greatly age-impaired activities. If relevant subject-matter expertise is equivalent between older and younger learners (as it is in laboratory studies of meaningless material), then an age-decrement is expected (type three in the table). In cases where older people are *less* expert about the material to be learned than younger ones (type four), particularly substantial age-decrements are expected. That is likely to be the case at present during initial learning to use computers, since age and expertise deriving from experience are negatively associated in that domain. (For example, the correlation between age and years of computer experience was -.46 in the study by Czaja, Sharit, 1993). Substantial age-decrements are indeed found in that domain (Czaja, 1996)[7]. In all the three categories cited, age differences are expected to be greater if a learning task is rapidly-paced, since older learners tend to work more slowly than younger ones. However, even when self-pacing is possible, an age-decrement in learning is likely (e.g., Elias, Elias, Robbins, Gage, 1987).

Type-two activities are identified in the table as “age-counteracted”, in that relevant expertise can help to reduce the information-processing problems of older individuals. It seems likely that some learning activities can be of this kind, providing that the processing difference between people of different ages is not made substantial by rapid pacing. Length of experience (a crude index of expertise) was positively predictive of learning outcomes by managers and by pilots in studies by Warr, Bunce (1995), Carretta, Ree (1994) respectively, and measures of prior job knowledge have been shown to predict flying training outcome (Ree, Carretta, Teachout, 1995). It may be that in type-two learning activities, older individuals who are more expert in terms either of content or of learning methods in the domain will be as effective as younger ones. However, research into age-patterns has not yet examined this possibility.

[7] A lack of underpinning knowledge (or interference from conflicting knowledge) is seen in some older people’s problems on initial exposure to computer-linked terms such as “file” and “enter”. Previous concepts with those labels need to be modified or inhibited before new learning about computers can occur.

Table 3. Age, information-processing effectiveness and expertise: Three types of learning activity.

	Pattern of information-processing effectiveness	Can expertise help?	Pattern of relevant expertise	Expected age-pattern	Type of activity
Complex mental activities, perhaps with no environmental support					
2:	OP < YP	Yes	OP > YP	OP = YP	Age-counteracted
3:	OP < YP	Yes	OP = YP	OP < YP	Age-impaired
4:	OP < YP	Yes	OP < YP	OP < < YP	Greatly age-impaired

OP: older people
YP: younger people

Summary answer to Question Five: There is clear evidence that older employees are less likely to take part in learning (the source of expertise), and that, when they do take part, they are less effective learners than younger people. Older individuals require more time than younger ones to reach the same learning criterion. On average they also learn less within a specified time, especially when cognitive demands are increased by rapid pacing. Possible causal factors underlying the age-decrement in learning include differences in recent relevant practice, in processing speed, in working memory, in forgetting partly-learned material and in a failure to inhibit perseverative errors.

Are there age-differences in the transfer of learning to job situations?

Discussions of age and learning have heavily concentrated on the acquisition of skills and knowledge, rather than their later application. That imbalance is unfortunate, since there is considerable informal evidence that much work-related learning is subsequently never used. For example, Baldwin, Ford (1988) suggest that no more than 10% of training expenditure actually results in transfer to the job. Given that there are problems in the transfer of what is learned by employees in general, we need to ask whether those are greater at older (or other) ages.

Transfer is typically viewed as having two aspects: the retention of learned material in its original (or an identical) context, and its generalisation to new but related settings. In examining possible age-differences, we therefore have to look at both aspects. In each case a review of research findings about the area in general will be followed by a consideration of possible age-differences.

In respect of the *retention* of learned material, it is clear that in the absence of subsequent practice forgetting can be quite rapid during the following weeks (e.g., Patrick, 1992; Swezey, Llaneras, 1997). Retention is strongly affected by the degree of initial learning, such that material which is more practiced or "over-learned" is better retained; degree of original learning is a key predictor of retention (Driskell, Willis, Copper, 1992; Rogers, 1996). Associated with that, *subsequent* practice of the original material builds up retention, whereas material which is not later used or practiced tends to be forgotten. Retention is also better when different elements of the material are somewhat interdependent, so that they may support each other by providing mutual associations, and when interference between different elements is not great (Healy, Clawson, McNamara, Marmie, Schneider, Rickard, Crutcher, King, Ericsson, Bourne, 1993).

It might be expected that older people will retain less material than younger ones because of several of those factors. Most important is a probable difference in the degree of initial learning. As indicated earlier, older people acquire new material more slowly than younger ones, so that after any given period of time they have on average learned less than younger people. Although everyone may have reached an *acceptable* level of learning in a training

course, it will regularly be the case that younger members of a group will have over-learned material to a greater degree. Given older learners' poorer acquisition, poorer retention is expected. There is some evidence that, although older individuals are likely more quickly to forget discrete items of information (if learning-attainment has not been equated), they may be as effective as younger ones in retaining general procedures or integrated material (Rogers, 1996). The possibility that broad principles and wide-ranging themes may not be subject to an age-decrement in forgetting requires further investigation.

Research into forgetting at different ages has been of two main kinds, either examining recall for events in real life or for material learned in the laboratory. In both cases, results have been somewhat inconsistent (Kausler, 1994). For instance, studies of the recall of previous events in a person's life have found either no age-decrement or better retention at younger ages. Such research suffers from the difficulty that one cannot control or measure the degree to which information was initially encoded and consolidated, or the frequency with which it has been recalled (and thus further consolidated) in intervening years. Control of initial learning is more possible in laboratory investigations, from which it appears that, when people of different ages reach equivalent levels of learning, their rate of forgetting is very similar. However, when the different groups receive merely the same number of learning trials (and thus older people's learning is less advanced), retention is significantly better at younger ages (Kausler, 1994; see also Rabbitt, Maylor, 1991).

In typical training or educational activities, older adults typically attain lower levels of consolidation than younger ones (see Section Five), so that poorer retention is expected for that reason. It may also arise from older people's greater susceptibility to interference from extraneous material (Hasher et al., 1991; see Section Two), since forgetting is in general greater when interference is possible. Subsequent processing of material which is incompatible with a prior learning task may therefore harm retention more in older than younger people. Another factor identified earlier is the extent to which originally-learned material is practiced again before later recall is examined. In job and similar settings, this is a question of the second component of transfer identified above: the generalisation of learned material to new (but related) situations. What factors affect this process, and are age-differences expected?

Studies of transfer of training in organisations have not sought to define precisely what information was initially acquired (as is sometimes possible in laboratory investigations). The approach is usually to examine to what extent job behaviour has changed after a learning episode. In published studies (which are in practice likely to show the most positive results) significant transfer of that kind is often found, but wide differences between situations are present (Baldwin, Ford, 1988). Factors influencing the amount of transfer may be reviewed under four headings: appropriateness of the training content, opportunities available, organisational support, and individual confidence.

The appropriateness of training content in studies of transfer has been examined in terms of the similarity of elements in the training and application situation, the degree of fidelity of a training simulator, the provision of instruction in general principles which might be applied across situations, etc. (Druckman, Bjork, 1994; Patrick, 1992; Swezey, Llaneras, 1997). In part, the issue is whether employees' training needs for a specific job have been clearly defined and met; is the learning which has been provided well suited to changes in job behaviour? That question also underlies the second issue: does a person have opportunities to apply what he or she has learned? Application opportunities derive in part from the similarity in content between training and job, but also from task-allocation decisions about specific individuals taken by a supervisor. For example, Ford, Quiñones, Sego, Sorra (1992) found that employees who were perceived by a supervisor to be more competent and likeable were asked to undertake tasks which provided a greater breadth of experience and were more complex. There is no published information about possible age-differences in such allocations

(with their varying potential for further learning and consolidation), but prejudice against older individuals may sometimes lead to them receiving fewer opportunities to apply their recent learning.

An age-difference may also be expected in relation to the third influence on transfer: organisational support. It has been shown that, when supervisors and colleagues encourage and reward the application of taught material (providing a positive "transfer climate"), motivation to transfer is greater (Seyler, Holton, Bates, Burnett, Carvalho, 1998) and training is more likely to yield positive outcomes in the work setting (Ford et al., 1992; Rouiller, Goldstein, 1993; Tracey, Tannenbaum, Kavanagh, 1995; Warr et al., 1998). Although direct evidence about a possible age-difference in this process is lacking, one might surmise that encouragement to apply new learning is more often given to younger employees, consistent with the fact that younger workers are asked more frequently to undertake training (Section Five) and with the negative attitudes widely held about older people (Section Two).

The fourth factor influencing transfer of learning is an individual's confidence, reflected in assertiveness in seeking out opportunities and undertaking new behaviours. This individual-level factor will combine with the other three (contextual) factors to affect the extent to which training is applied. For example, Ford et al. (1992) found that employees previously describing themselves as confident in performing the trained tasks were more likely to report later having had opportunities actually to perform them. In the study by Warr et al. (1998), trainees' learning confidence not only predicted later transfer but did this in combination with organisational support; multiple regression analyses indicated that both learning confidence and a positive transfer climate made independent contributions to the extent of later changes. No studies have asked whether age-differences in confidence yield less transfer at older ages, but such an outcome appears possible.

Summary answer to Question Six: There is considerable evidence that transfer from training settings into the work-place is problematic at all ages. Transfer is a question of both the retention and the generalisation of learned material, and there are reasons to expect that older employees will exhibit less transfer of both kinds. Poorer retention at older ages is likely because of poorer initial learning, less subsequent consolidation through practice, and greater susceptibility to interference. Poorer generalisation may arise from the provision of fewer opportunities for application and more restricted organisational support.

How can older workers' learning and transfer be increased?

As summarised in Sections Five and Six, older individuals can certainly learn, retain and transfer new material, but they are in general somewhat less successful in those respects than younger ones. It is important to emphasise that the patterns outlined in most research publications concern only average trends. At all ages there are wide inter-individual differences, and those become greater in older samples (Fozard, Vercruyssen, Reynolds, Hancock, Quilter, 1994; Morse, 1993). It is usually the case that, even when an overall age-decrement is found, some older individuals are above the average level of younger ones. Many *other* attributes influence task performance, and age on its own is a relatively poor predictor. (Age-patterns will be set into a broader framework of individual attributes in Section Eight.)

Given the widespread need for increased learning among the workforce in a period when that workforce is ageing, we need to develop and test procedures to remedy the relative problems of older individuals identified here. Although training and other development activities may result from decisions taken by employees' managers, in almost all cases individuals at work have some influence on the activities they undertake. It is thus important to act to modify the views and actions of both individuals and their managers, often by focussing on their underlying motivation. Issues of motivation and its organisational

consequences tend to be similar for the two issues examined in Section Five, level of participation in learning activity and success in that activity. The two themes will thus be considered together at this point.

Proposals to improve the learning participation and learning success of older people are illustrated below, drawing upon publications by Belbin E, Downs, 1965; Belbin E, Belbin R.M, 1972; Belbin R.M, 1965, 1969; Plett, Lester, 1991; Sterns, Doverspike, 1988; Warr, 1994a, 1994b; Warr, Birdi, 1998; Warr, Pennington, 1993. Systematic comparisons of the effect of specific interventions on older versus younger employees have rarely been carried out, but laboratory research has found that, although older learners can become very successful after an intervention, age-differences typically remain since younger individuals also improve their performance, Czaja, Drury, 1981; Kelley, Charness, 1995; Kramer, Larish, 1996. It seems very likely that employees of all ages (not merely the older ones) would benefit from modifications of the kind outlined here.

1. In order to attract older employees into learning situations, increases in motivation will be widely required. An employee's motivation derives from the balance of appraisals of the costs and benefits of specific opportunities and of the broader "learning climate" of an organisation. Possible actions to increase older people's learning motivation include: public recognition of learning achievements through awards, symbols, etc.; introduction of a skill-based pay programme, in which wage levels are linked to demonstrated competence after training, Murray, Gerhart, 1998; other concrete benefits of participation in learning, such as tokens for exchange against shopping vouchers or company products; encouragement from older role models, who report favourably on their learning activities; more explicit provision of information about the personal benefits of participation; publicity and specific guidance geared to older staff as well as younger ones; and possibly making promotion or transfer contingent upon specific learning achievements. There has recently been a tendency for organisations to become flatter than previously, with fewer levels through which employees might be promoted. To reduce possible impairments to motivation associated with fewer promotion opportunities, it may be appropriate instead that long-serving staff can look forward to lateral transfers, backed up by necessary learning activities.

2. The level of employees' motivation is influenced by their perceptions of the organisation's overall learning climate. A positive climate of that kind is evidenced by managers making time for subordinates' (and their own) learning activity despite pressures to maintain production or service levels, the provision of many different kinds of learning opportunities, support and encouragement from bosses and colleagues, and a continuous concern to identify employees' learning needs and to meet those in an effective manner. The learning climate in an organisation must particularly address the lower learning motivation of *older* employees; without special attention to that group, the current marked age-imbalance in training participation will not be rectified.
   A positive learning climate of this kind is attractive in principle, but in practice short-term pressures, coupled with absenteeism which makes it difficult to free employees for training, often result in a attitudes to learning which are rather negative. There is no doubt that a positive climate can only be sustained with strong encouragement from senior members of management. Those individuals are in a position to reward junior and middle managers both for their own learning and for the learning which occurs among their subordinates, if they wish to do so. Recommendations about older employees must be welcomed at senior levels of an organisation if they are to be truly effective.

3. Older people's learning confidence (strongly correlated with learning motivation; r = 38 in the study by Warr, Birdi, 1998) needs to be boosted by actions of the kind illustrated here. It is desirable to identify those older employees who are greatly anxious about their lack of recent experience or have other reasons to fear training activities, in order to seek to assist them. The provision to such individuals of early feedback indicating learning progress is needed. In some cases, assistance might involve a graded sequence from simple to more difficult training experiences, to ensure that confidence is built up in preliminary learning activities before exposure to complex learning tasks. In other cases, pre-training as part of a current programme is desirable, either in terms of content expertise or learning strategies; see 4 and 5, below.

4. Pre-training may be useful to increase the content expertise of some older employees. If a person lacks necessary underpinning knowledge (declarative or procedural), he or she will soon fall behind in any training activity requiring that knowledge. For example, some older individuals with limited education (many years previously) may need assistance with basic skills of literacy or numeracy. Specific types of training may bring their own needs for prior enhancement of necessary expertise which is typically taken for granted. For instance, some older employees at the present time may lack a basic knowledge of the terminology and operation of a computer-linked keyboard. In other cases, some pre-training in the basic issues and terms to be adopted during a training programme may be desirable; for example, all jargon expressions should be presented and practiced at the outset, with a written list for later use. The general need is to be systematic in obtaining from trainees information which might indicate that some of them need pre-training, in order to bring everyone to a acceptable level of content expertise before principal training activities commence.

5. A second form of pre-training is in terms of learning strategies and associated study skills which might assist in a given setting, helping older individuals to "learn how to learn". For example, advice might be useful about cognitive learning strategies such as procedures to increase mental organisation or about behavioural learning strategies to gain assistance from fellow-trainees, as might suggestions about self-monitoring and procedures to reduce anxiety when progress is felt to be poor (Warr, Allan, 1998). Procedures for time-management and the personal scheduling of learning activities might also be discussed as part of this pre-training (or built into principal learning themes themselves).

6. Training procedures need to be based upon older individuals' limitations and expertise, as summarised in earlier sections. For example, since most adult learning in everyday life takes the form of active problem-solving, "guided discovery learning" may be particularly effective (Belbin R.M, 1965, 1969; Mullan, Gorman, 1972). Learning situations should be created through which a person finds out himself or herself the principles and relationships which are important in the area. Discovery tasks should be set for individuals or small groups, who should be required to answer questions about the material being studied. For example, Czaja, 1996, reported that "goal-oriented training" reduced time and errors (at all ages), by requiring learners to work out the answers to defined questions with help from a specially designed manual. More generally, trainees should be encouraged to ask many questions, of other trainees (perhaps through dyadic exercises) as well as of the trainer.

7. Training should be structured in a way which assists older learners. For example, abstract concepts should be presented through concrete (preferably familiar) examples, and one should build out from trainees' prior knowledge and experience wherever possible. Practical illustrations and/or hands-on experiences are particularly desirable, and the value

of learners' previous experience to the new learning might be stressed. In cases when the presentation of abstract material is unavoidable, practical implications should be examined and relevance to job settings should be emphasised.

8. Mutual support and information-sharing should be facilitated, so that learning is from each other as well as from trainers. Associated with that, it is desirable to develop an atmosphere which is non-threatening and non-competitive, so that older trainees need not be anxious about losing face if their progress is sometimes slow.

9. A relatively slow pace of presentation should be adopted, permitting older trainees to determine that as far as possible. Self-pacing may be possible, and the need for trainees to process information very rapidly should be minimised. A general emphasis on accuracy rather than speed is desirable. "Open" learning activities or project work under each person's timing control should be considered for part of a training programme. For example, material might be made available outside training sessions, for additional practice and remedial self-study. More generally, ample opportunity for practice and repetition is necessary.

10. The load on working memory (simultaneous manipulation and storage of information) should be reduced, by separating in time different kinds of mental tasks whenever possible. External memory aids should be used to reduce older learners' problems in this regard: notes, lists, handouts, specific decision-making cues, menus, and other forms of environmental support. Generally, rapid information-processing that is entirely "within the head" should be reduced as much as possible.

11. Written material within a training programme should be presented in simple language, avoiding negatives and the need to draw inferences; writing should be in the active rather than the passive voice (Hartley, 1994). Pictorial illustrations can reduce problems of working memory and text comprehension at older ages, and should be encouraged (Morrell, Echt, 1996).

12. In view of older learners' greater problems of unlearning initial errors, it is desirable to minimize errors early in learning. This approach has the advantage of sustaining confidence as well as minimising potential negative interference. Nevertheless, errors will occur at all ages, and it may be useful to emphasise their inevitability. When errors are committed, encourage trainees to learn from them, by working out (and asking questions about) possible reasons for their occurrence. Conversely, ensure that praise is offered for successful performance.

13. Since older people may retain less material between training sessions (due to relatively poorer initial learning), it is desirable to check that material covered in a previous session is still available in memory for use in a later session. If the outcomes of previous learning are no longer available, training in a later session which is based on the assumption that they have been retained will clearly be ineffective.

14. Where feasible, use older individuals as trainers, as guest presenters or to provide illustrations of training content, rather than younger ones. There may be merit in creating groups of learners all of whom are older (rather than mixing older and younger ones), since problems of pacing and older people's anxiety about appearing deficient are thereby minimised. On the other hand, some organisations feel that this may sustain prejudice and

stereotypes about older employees, and that possibly useful learning from younger colleagues is thereby prevented.

15. A proportion of older trainees may have some difficulty seeing or hearing in certain circumstances, and steps should be taken to reduce such problems. For example, one should use large-print material, strongly-contrasting colours, bold typefaces, non-glare blackboards and a suitable level of illumination. Sound volume levels need to be checked, and spoken input should be adequately slow and audible.

16. In many settings, on-the-job learning as part of project work, job rotation, etc. (rather than through separate instruction identified as "training") may be particularly suitable for older employees. Work-based development of this kind combines problem-solving about job problems with intertwined learning activities. Work-based activities have been shown to be of special importance to many managers, for example taking a high level of responsibility or developing new ways to tackle issues (McCauley, Ruderman, Ohlott, Morrow, 1994), but they appear to have considerable potential also at other levels of an organisation. Older employees may be specially effective in these activities, since they can bring to bear expertise gained over several years in different settings; both the organisation and the older employee may thus derive special benefits from this form of learning.

17. Associated with several of these suggestions (and specifically with number 2), there is an overriding need to alter negative stereotypes about older employees. Older adults can as a group learn as much as younger ones, provided that some steps of the kind illustrated here are taken. However, the more that special procedures to assist older people are substantial and time-consuming, the more likely is it that negative attitudes will be reinforced, since older employees' problems will become more visible and costly. It may be wise to argue for interventions of this kind on the grounds that *everyone's* learning will be improved, rather than arguing specifically the case for older learners. That theme can be linked to the development of a "continuous learning culture", which encompasses employees of all ages but recognises the needs of older ones specifically because of their growing numbers in the labour market.

The seventeen suggestions above were primarily aimed to increase learning activities by older workers and to enhance their success in those activities. Problems of transferring new learning into a job situation have been outlined in Section Six, and proposals to assist transfer in older age-groups will be considered next. These concern both the retention of material and its generalisation to new situations.

1. Given the central importance of over-learning in people's ability to recall taught material at a later time, it is clear that older learners will gain particularly from additional practice to consolidate training content. It is insufficient merely to *attain* a criterion level during training; learners have to practice beyond that criterion level, in order to consolidate material for later recall. Once again, the recommendation is for more time to be spent in learning by older employees.

2. "Relapse prevention" or "refresher" activities are widely recommended subsequent to any complex learning activity (Patrick, 1992; Swezey, Llaneras, 1997). These involve additional practice in problematic areas and perhaps a review of progress made and constraints experienced since the training. Although such activities are specially useful for older staff, it is usually inappropriate to identify that group alone (by excluding younger

colleagues) for relapse prevention sessions, since negative perceptions of the need for such selectivity would compound any current age-prejudice.

3. The application of taught material to work activities will only occur if opportunities are provided in a job to do that. Linked to the need for mental consolidation in order to permit retention (above), older employees must be able to use new material in their daily work. The general problem in this area is that often no member of management is formally responsible for transfer activities after a training course has ended. Prior to and during the training, staff of a training department are clearly responsible for achievements, but subsequent to that training their attention is likely to shift to the next set of commitments. It is widely suggested that some form of "transfer partnership" (Broad, Newstrom, 1992) of managers, trainers and trainees should be established to define each person's responsibilities, to set specific targets and to create procedures to monitor those targets. There is a general need to design systematically the transfer process, in parallel with design of the training itself.
   A minimal requirement (at all ages) is that an employee should discuss with his or her boss the aims and outcomes of a training activity, both before and after that activity. It is desirable to establish specific transfer targets in each case, ensuring the application of what has been learned in job settings. This learning action plan may sometimes require a reallocation of job tasks so that a newly-trained individual has the opportunity to practice and extend his or her new expertise. In all cases, a follow-up review of progress within the action plan is important.

4. In busy organisations, encouragement for such activities is needed within the wider learning climate (see 2 in the discussion of learning activities, above). Unless managers and colleagues provide support and encouragement for the transfer of learning, little success is likely since more short-term objectives will be pursued instead. Support for transfer derives ultimately from senior management, and their role in the optimal utilisation of older staff cannot be stressed too strongly. Senior managers' encouragement of the transfer of material from training to job should explicitly emphasise a concern for older staff.

Summary answer to Question Seven: Deriving from research and practice in the areas of learning and transfer, recommendations can be made to improve the effectiveness of older employees. These are addressed to individuals' motivation, as well as to the creation of a positive learning climate which specifically encourages the development of older staff. In many of the proposals, additional learning time for older people appears desirable. A transfer partnership of managers, trainers and trainees is suggested for the better retention and application of new expertise in job settings.

What about non-cognitive features?

In seeking to understand the job and learning performance of older people relative to younger ones, most authors have concentrated on the cognitive features examined here: information-processing effectiveness and relevant expertise. However, it is clear that job performance is also determined by non-cognitive processes of motivation, interests and personal syles. These have been almost entirely absent from the literature on age and employment.

This section will consider a general framework of four components which are likely to influence job effectiveness. They will be introduced irrespective of employee age, after which some implications for age-comparisons will be suggested. The components (similar to those proposed by Ackerman, 1996) are as follows:

1. *Information-processing ability*, sometimes referred to as "cognitive ability" (Borman et al., 1991; Hunter, 1986; Hunter, Schmidt, 1992), "fluid intelligence" (Cattell, 1963), "mechanics of the mind" (Baltes, 1990, 1991), or "intelligence-as-process" (Ackerman, 1996). This cognitive attribute has often been shown to predict job performance (Hunter, Hunter, 1984) and training success (Ackerman, Kanfer, Goff, 1995; Ree, Carretta, 1998; Ree, Earles, 1991) in studies which do not examine age-differences. Measurement has typically been made through psychometric tests of ability or fluid intelligence, but specific cognitive processes illustrated in Section Two load heavily on scores from such tests. For instance, Babcock (1994) reported that scores on Raven's Advanced Progressive Matrices Test (of fluid intelligence) were correlated 55 with working memory and 56 with processing speed on demanding tasks; in Salthouse's (1993c) study these values were 69 and 62 respectively. In addition to general indicators of information-processing, other measures have been developed to tap more specific abilities, such as mathematical or spatial reasoning.

2. *Expertise*, sometimes referred to as "wisdom" (Baltes, 1990, 1991), "pragmatic knowledge" (Baltes, 1990, 1991), "acculturation knowledge" (Horn, Hofer, 1992), "crystallised intelligence" (Cattell, 1963), "practical intelligence" (Sternberg, Wagner, 1986) or "intelligence-as-knowledge" (Ackerman, 1996). As described in Section Three, job-related expertise has been shown to predict overall job effectiveness. Prior job knowledge is also significantly associated with success in training, over and above the impact of cognitive ability (Ree et al., 1995).
   Several studies have examined job performance as a function of information-processing ability in combination with relevant expertise (measured in terms of job knowledge). It appears that greater processing ability leads to greater expertise, which in turn yields better job performance (Borman et al., 1991; Ree et al., 1995; Schmidt, Hunter, 1992). Those studies have not examined possible age-patterns. However, given that expertise can be retained over long periods, especially with continuing practice (Section Six), the slightly lower information-processing scores sometimes observed at older ages may have little impact in job settings: job-related expertise is a major predictor of performance.

3. *Personality*, which may be construed in terms of relatively broad concepts (e.g., the Big Five or Big Six) or through a larger number of more specific features. The Big Five are usually identified as extraversion (or surgency), agreeableness, conscientiousness, emotional stability and intellect (or openness to experience) (e.g., Goldberg, 1990). A Big Six structure has been proposed by Jackson, Paunonen, Fraboni, Goffin (1996), separating Conscientious-ness into Industriousness and Methodicalness. A larger number of characteristics are covered in, for example, the Occupational Personality Questionnaire (Saville, Holdsworth, 1993), which contains scales of 30 more focussed attributes, such as being persuasive, independent, practical, innovative, worrying and decisive.
   There is growing evidence that personality attributes significantly predict job performance (e.g., Tett, Jackson, Rothstein, 1991), although difficult conceptual and practical issues remain to be resolved (Pulakos, Borman, Hough, 1988; Warr, 1998). Patterns of overlap between personality traits and the two previous features have rarely been examined, but current evidence suggests, for example, that the personality dimension of intellect (or openness to experience) is significantly associated with vocabulary expertise (crystallised intelligence) but not with information-processing ability (fluid intelligence) (Ackerman, Heggestad, 1997). Borman, White, Dorsey (1995) have expanded the predictors of job performance beyond information-processing ability and job expertise (see two paragraphs above), to show that aspects of conscientiousness make additional contributions to performance over and above ability and relevant expertise.

4. *Motivation and interests*, covering a wide range of affective (emotional) factors which can influence behaviour at work and elsewhere. Under this heading we might consider specifically vocational interests such as those described by Holland (1973): realistic, artistic, investigative, social, enterprising and conventional. In addition, people vary in their more specific interests, for example relative to particular activities in their job. Interests tend to be linked to broader motivations, which both energise and direct activity. For instance, in terms of energy, employees differ in the level or amount of their motivation; in respect of direction, some people are more motivated by rewards in terms of affiliation or recognition from colleagues, whereas others are more attracted by the prospect of material gain or the possession of power.

It is part of the definition of motivation and interests that they can be reflected in behaviour. Potential behavioural outcomes have sometimes been examined in terms of people's "expectancies" and "valences", the perceived probability that an outcome will be attained and the personal value or cost attached to each outcome. However, there has been little research to define principal sources of different patterns of expectancies and valences, in part because they vary in so many ways between individuals.

Motivational characteristics overlap with the preceding three categories. For example, an interest in scientific and engineering jobs tends to be associated with greater mathematical ability (Ackerman, Heggestad, 1997). Motivation and information-processing ability work together to determine the areas in which expertise will be acquired as well as the depth of that expertise; people who are highly motivated and highly able will acquire greater expertise than others, and content differences will arise from differences in interest. Some motivational and personality constructs are inter-linked both conceptually and in practice; for example, employees who have a strong power motivation tend to describe their personalities as being controlling and persuasive (Saville, Holdsworth, 1992).

What is known about age-differences in these four determinants of behaviour? Most research (as illustrated in Section Two) has focussed on information-processing, consistently showing that older people tend to be less effective in many ways. Some studies have examined expertise in relation to age (Section Three), but relatively little is known about the impact of specific job experiences on that expertise. It is certain that in some circumstances older people can be more effective than younger ones because of their greater expertise, but it is also the case that on occasions expertise is greater at younger ages (Section Four). Research attention needs to switch from the first to the second element of this framework. "It is clearly time for researchers to systematically inquire about the *content* of intellect, that is to discover what it is that people know, and how that knowledge changes during adulthood" (Ackerman, 1996, p. 250).

However, research must also shift beyond that. Almost nothing is known about the other two elements (personality, and motivation and interests) in relation to age and work performance. It seems very likely that significant differences between employees of different ages will be found in respect of personality and motivation, but the traditional research emphasis on information-processing has been acompanied by an almost universal disregard for these areas. In each case we need to know a great deal more about the nature of age-differences, the factors giving rise to any difference, and the impact of an age-difference on job performance.

Cross-sectional age-patterns in Big Five personality attributes have been summarised by McRae, Costa (1990). Evidence suggests that older adults are less extraverted and more agreeable, but that no overall age-differences exist for conscientiousness, emotional stability or intellect. These broad characteristics may usefully be divided into smaller attributes. For example, extraversion subsumes more limited traits of sociability, liveliness, impulsiveness and sensation-seeking. Studies of age-patterns in more specific aspects of personality have

yielded varying results, associated with different samples and measures (Warr, 1994a). In a large sample of British adults, cross-sectional age-decrements were found in respect of persuasiveness, outgoingness, affiliativeness, being democratic, change-oriented, conceptual, innovative, competitive, achievement-oriented and decisive; conversely, older people were more modest, traditional, detail-conscious and conscientious; for other scales, age-differences were not marked (Saville, Holdsworth, 1993). In an American study, Truett (1993) observed a cross-sectional increase in conservatism (particularly between 40 and 50 years), for both men and women at all levels of education. Few longitudinal investigations have extended across substantial periods, but Jones, Meredith (1996) reported increases in self-confidence and dependability over four decades.

Such differences appear extremely likely to be reflected in the work behaviour of older relative to younger employees. In seeking to understand age-patterns at work, it is essential to consider personality patterns as well as cognitive factors. That is also the case with the fourth determinant of behaviour, motivation. In respect of context-free values (not restricted to the work-place), studies have suggested that older adults tend to have less concern for personal achievement and skills and have greater interest in more interpersonal goals (Hess, 1994). It is not known how far that difference is reflected in *job-related* motivation. However, older workers are likely to have different job concerns than younger ones, associated with their changed family position and perceptions of themselves at different stages in the life-course. For example, lower motivation for training was reported in Section Five. Warr (1997) has drawn together the limited empirical evidence about preferences at different ages for key job features, suggesting that across the years overall decreases are likely in the perceived importance of high job demands, job variety and feedback; increases with age seem possible in employees' concern for job security and physical security; and an interest in skill utilisation and in a high wage is likely to increase and then decrease.

For example, older employees may be less interested in a high level of job demands for three reasons: habituation, reduced expected value, and declines in energy as they become older. In the first case, people become accustomed to recurring stimuli of all kinds, such that their potential to reward or punish becomes less; in work settings, this may be seen in a reduction in enthusiasm for recurring tasks. An overlapping explanation is in terms of a decline with age in the expected value of achieving familiar goals; the balance of costs and rewards may be felt to have changed. Third, for a proportion of people, physical and/or mental energy may decline after middle age. These people become less able to cope effectively with demands that had previously been acceptable or attractive, so that lower imposed goals become more desirable.

Almost no systematic research has addressed issues of age and motivation at work. One possibility is that, whatever the *average* pattern, inter-individual differences in motivation and interest become greater at older ages. The importance of giving specific consideration to the actual characteristics of individuals, rather than making general assumptions based on group-membership, is very clear.

Although findings about information-processing ability and expertise have advanced our understanding about age-differences in job settings, we are still far away from a complete grasp of the issues affecting older and younger people's work behaviour. The prime need at present is the adoption of a broader perspective, looking not only at processing ability and relevant expertise, but also at age-patterns in personality traits and in motivation and interests.

Summary answer to Question Eight: Most research has investigated cognitive features of information-processing ability and relevant expertise. However, job performance is also determined by non-cognitive aspects of personality, motivation and interests. Some age-differences have been found in particular traits of personality, and differences in motivation and specific interests appear extremely likely. Deeper understanding of age and job

performance requires a shift of research attention to consider also these non-cognitive features.

References.

1. Ackerman P.L. A theory of adult intellectual development: Process, personality, interests, and knowledge. *Intelligence* 1996;22:227-257.
2. Ackerman P.L, Heggestad E.D. Intelligence, personality, and interests: Evidence for overlapping traits. *Psychological Bulletin* 1997;121:219-245.
3. Ackerman P.L, Kanfer R, Goff M. Cognitive and noncognitive determinants and consequences of complex skill acquisition. *Journal of Experimental Psychology* 1995;1:270-304.
4. Allard F, Starkes J.L.). Motor-skill experts in sports, dance, and other domains. In Ericsson K.A., Smith J. (eds.), *Toward a General Theory of Expertise*, Cambridge University Press. 1991;126-152.
5. Allen P.A., Ashcraft M.H., Weber T.A. On mental multiplication and age. *Psychology and Aging*, 1992;7:536-545.
6. Anderson J.R. Acquisition of cognitive skill. *Psychological Review*, 1982;89:369-406.
7. Avolio B.J., Waldman D.A., McDaniel M.A. Age and work performance in non-managerial jobs: The effects of experience and occupational type. *Academy of Management Journal*, 1990;33:407-422.
8. Babcock R.L. Analysis of adult age differences on the Raven's Advanced Progressive Matrices Test. *Psychology and Aging*, 1994;9:303-314.
9. Bäckman L., Dixon R. A. Psychological compensation: A theoretical framework. *Psychological Bulletin*, 1992;112:259-283.
10. Baldwin T.T., Ford J. K. Transfer of training: A review and directions for future research. *Personnel Psychology*, 1988;41:63-105.
11. Baltes M.M., Carstensen L.L. The process of successful ageing. *Ageing and Society*, 1996;16:397-422.
12. Baltes P.R. Psychological perspectives on human aging: The model of selective optimization with compensation. In Baltes P.B., Baltes M.M. (eds.), *Successful Aging*, Cambridge University Press, 1990;1-34.
13. Baltes P.R. The many faces of human ageing: Toward a psychological culture of old age. *Psychological Medicine*, 1991;21:837-854.
14. Baltes P.R. The aging mind: Potential and limits. *The Gerontologist*, 1993;33:580-594.
15. Baltes P.R., Smith J. Towards a psychology of wisdom and its ontogenesis. In Sternberg R. J. (ed.), *Wisdom: Its Nature, Origins, and Development*,. Cambridge: Cambridge University Press, 1989;87-120.
16. Belbin E., Belbin R.M. *Problems in Adult Retraining*. London: Heinemann 1972.
17. Belbin E., Downs S.M. Interference effects from new learning: Their relevance to the design of adult training programs. *Journal of Gerontology*, 1965;20:154-159.
18. Belbin R.M. *Training Methods for Older Workers*. Paris: OECD 1965.
19. Belbin R.M. *The Discovery Method in Training*. London: HMSO 1969.
20. Billings A.E. Age-related employment costs at the Travelers Companies in 1981. *Aging and Work*, 1983;6:7-14.
21. Bird M.W. Changes in work behaviour following supervisory training. *Journal of Management Studies*, 1969;6:331-345.
22. Birdi K., Allan C., Warr P.B. Correlates and perceives outcomes of four types of employee development activity. *Journal of Applied Psychology*, 1997;82:845-857.
23. Birren J.E. Age and decision strategies. *Interdisciplinary Topics in Gerontology*, 1969;4:23-36.

24. Borman W.C., White L.A., Dorsey D. Effects of ratee task performance and interpersonal factors on supervisor and peer performance ratings. *Journal of Applied Psychology*, 1995;80:168-177.
25. Borman W.C., White L.A., Pulakos E.D. Oppler S.H. Models of supervisory performance ratings. *Journal of Applied Psychology*, 1991;76: 863-872.
26. Bosman E.A. Age-related differences in the motoric aspects of transcription typing skill. *Psychology and Aging*, 1993;8:87-102.
27. Bowers W.H. An appraisal of worker characteristics as related to age. *Journal of Applied Psychology*, 1952;36:296-300.
28. Broad M.L., Newstrom J.W. *Transfer of Training*. Reading, Mass.: Addison-Wesley 1992.
29. Carretta T.R., Ree M.J. Pilot-candidate selection method: Sources of validity. *International Journal of Aviation Psychology*, 1994;4:103-117.
30. Cattell R.B. Theory of fluid and crystallized intelligence. *Journal of Educational Psychology*, 1963;54:1-22.
31. Charness N. Aging and problem-solving performance. In. Charness N (ed.), *Aging and Human Performance*, Chichester: Wiley. 1985;225-259.
32. Charness N. Age and expertise: Responding to Talland's challenge. In Poon L.W,. Rubin D.C, Wilson B.A (eds.) *Everyday Cognition in Adulthood and Late Life*, Cambridge: Cambridge University Press. 1989;437-456.
33. Charness N., Campbell J.I.D. Acquiring skill at mental calculation in adulthood: A task decomposition. *Journal of Experimental Psychology: General*, 1988;117:115-129.
34. Charness N., Bosman E.A. Expertise and aging. In. Hess T.M (ed.), *Aging and Cognition: Knowledge, Organization, and Utilization*, Amsterdam: Elsevier, 1990;344-385.
35. Cherry K.E. Stadler M.A. Implicit learning of a nonverbal sequence in younger and older adults. *Psychology and Aging*, 1995;10:379-394.
36. Cleveland J.N., Shore L.M. Self- and supervisory perspectives on age and work attitudes and performance. *Journal of Applied Psychology*, 1992;77:469-484.
37. Cohen G., Faulkner D. Memory for proper names: Age differences in retrieval. *British Journal of Developmental Psychology*, 1986;4:187-197.
38. Cole S. Age and scientific performance. *American Journal of Sociology*, 1979;84:958-977.
39. Cornelius S.W., Caspi A. Everyday problem solving in adulthood and old age. *Psychology and Aging*, 1987;2:144-153.
40. Courtney S. *Why Adults Learn: Towards a Theory of Participation in Adult Education.* London: Routledge 1992.
41. Craik F.I.M, Jacoby L.L. Aging and memory: Implications for skilled performance. In. Rogers W.A, Fisk A.D, Walker N (eds.), *Aging and Skilled Performance*, Mahwah NJ: Erlbaum, 1996;113-137.
42. Craik F.I.M., Jennings J.M. Human memory. In Craik F.I.M., Salthouse T.A. (eds.), *The Handbook of Aging and Cognition*, Hillsdale, NJ: Erlbaum, 1992;51-110.
43. Czaja,S. Aging and the acquisition of computer skills. In Rogers W.A, Fisk A.D, Walker N (eds.), *Aging and Skilled Performance*, Mahwah NJ: Erlbaum 1996;201-220.
44. Czaja S.J., Drury C.G. Aging and pretraining in industrial inspection. *Human Factors*, 1981;23:485-494.
45. Czaja S.J., Sharit J. Age differences in the performance of computer-based work. *Psychology and Aging*, 1993;8:59-67.
46. De la Mare G.C., Shepherd R.D. Ageing: Changes in speed and quality of work among leather cutters. *Occupational Psychology*, 1958;32:204-209.
47. Denney N.W. Everyday problem solving: Methodological issues, research findings, and a model. In Poon L.W., Rubin D.C, Wilson B.A. (eds.), *Everyday Cognition in Adulthood and Late Life*, Cambridge: Cambridge University Press, 1989;330-351.

48. Department for Education and Employment. *Labour Market and Skill Trends* 1996/1997. London: DfEE 1996.
49. Department of Employment. *Training Statistics*. London: HMSO 1994.
50. Dillingham A.E. Age and workplace injuries. *Aging and Work*, 1981;4:1-10.
51. Dixon R.A., Bäckman L. The concept of compensation in cognitive aging: The case of prose processsing in adulthood. *International Journal of Aging and Human Development*, 1992;36:199-217.
52. Dixon R.A., Kurzman D., Friesen I.C. Handwriting performance in younger and older adults: Age, familiarity, and practice effects. *Psychology and Aging*, 1993;8:360-370.
53. Doering M., Rhodes S.R., Schuster M. *The Aging Worker: Research and Recommendations*. Beverly Hills: Sage 1983.
54. Driskell J.E., Willis R.P., Copper C. Effect of overlearning on retention. *Journal of Applied Psychology*, 1992;77:615-622.
55. Druckman D., Bjork R.A. *Learning, Remembering, Believing*. Washington DC: National Academy Press 1994.
56. Dulaney C.L, Rogers W.A. Mechanisms underlying reduction in Stroop interference with practice for young and old adults. *Journal of Experimental Psychology Learning, Memory, and Cognition*, 1994;20:470-484.
57. Dye D.A., Reck M., McDaniel M.A. The validity of job knowledge measures. *International Review of Selection and Development*, 1993;1:153-157.
58. Elias P.K., Elias M.F., Robbins M.A., Gage P. Acquisition of word-processing skills by younger, middle-age, and older adults. *Psychology and Aging*, 1987;2:340-348.
59. Ericsson K.A., Smith J. *Toward a General Theory of Expertise*. Cambridge: Cambridge University Press 1991.
60. Ferris G.R., Yates V.L., Gilmore D.C., Rowland K.M. The influence of subordinate age on performance ratings and causal attributions. *Personnel Psychology*, 1985;38:545-557.
61. Finkelstein L.M., Burke M.J., Raju N.S. Age discrimination in simulated employment contexts: An integrative analysis. *Journal of Applied Psychology*, 1995;80:652-663.
62. Fisk J.E., Warr P.B. Age and working memory: The role of perceptual speed, the central executive, and the phonological loop. *Psychology and Aging*, 1996;11:316-323.
63. Fisk J.E., Warr P.B. Associative learning and short-term forgetting as a function of age, perceptual speed, and central executive functioning. *Journal of Gerontology: Psychological Sciences*, in press 1998.
64. Ford J.K., Quiñones M.A., Sego D.J., Sorra J.S. Factors affecting the opportunity to perform trained tasks on the job. *Personnel Psychology*, 1992;45:511-527.
65. Fossum J.A., Arvey R.D., Paradise C.A., Robbins N.E. Modeling the skills obsolescence process: A psychological/economic integration. *Academy of Management Review*, 1986;11:362-374.
66. Fozard J.L., Vercruyssen M., Reynolds S.L., Hancock P.A., Quilter R.E. Age differences and changes in reaction time: The Baltimore Longitudinal study of aging. *Journal of Gerontology: Psychological Sciences*, 1994;49:P179-P189.
67. Giniger S., Dispenzieri A., Eisenberg J. Age, experience, and performance on speed and skill jobs in an applied setting. *Journal of Applied Psychology*, 1983;68:469-475.
68. Goldberg L.R. An alternative "description of personality": The Big Five factor structure. *Journal of Personality and Social Psychology*, 1990;59:1216-1229.
69. Green F. The determinants of training of male and female employees in Britain. *Oxford Bulletin of Economics and Statistics*, 1993;55:103-122.
70. Hackett R.D. Age, tenure, and employee absenteeism. *Human Relations*, 1990;43:601-619.
71. Hartley J. *Designing Instructional Text*. East Brunswick, NJ: Nichols Publishing 1994.
72. Hasher L., Stolzfus E.R., Zacks R.T., Rypma B. Age and inhibition. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 1991;17:163-169.

73. Hasher L, Zacks R.T. Working memory, comprehension, and aging: A review and a new view. In Bower G.H. (ed.), *The Psychology of Learning and Motivation*,. San Diego: Academic Press, 1988;22:193-225.
74. Hashtroudi S., Chrosniak L. D., Schwarz B.L. Effects of aging on priming and skill learning. *Psychology and Aging*, 1991;6:605-615.
75. Healy A.F., Clawson D.M., McNamara D.S., Marmie W.R., Schneider V.I., Rickard T.C., Crutcher R.J., King C.I., Ericsson K.A., Bourne L.E. The long-term retention of knowledge and skills. *The Psychology of Learning and Motivation*, 1993;30:135-164.
76. Hess T.M. Social cognition in adulthood: Aging-related changes in knowledge and processing mechanisms. *Developmental Review*, 1994;14:373-412.
77. Hogarth T., Barth M.C. Costs and benefits of hiring older workers: A case study of B & Q. *International Journal of Manpower*, 1991;12(8):5-17.
78. Holland J.L. *Making Vocational Choices: A Theory of Careers*. Englewood Cliffs NJ: Prentice-Hall 1973.
79. Horn J.L., Hofer S.M. Major abilities and development in the adult period. In Sternberg R.J., Berg C.A. (eds.), *Intellectual Development*, Cambridge: Cambridge University Press, 1992;44-99.
80. Horner K.L., Rushton J.P., Vernon P.A. Relation between aging and research productivity of academic psychologists. *Psychology and Aging*, 1986;1:319-324.
81. Hunter J.E. Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior*, 1986;29:340-362.
82. Hunter J.E., Hunter,R.F. Validity and utility of alternative predictors of job performance. *Psychological Bulletin*, 1984;96:72-98.
83. Hunter J.E., Schmidt F.L. Developing a causal model of processes determining job performance. *Current Directions in Psychological Science*, 1992;1:89-92.
84. Ilmarinen J., Tuomi K., Klockars M. Changes in the work ability of active employees over an 11-year period. *Scandinavian Journal of Work and Environmental Health*, 1997;23, supplement 1:49-57.
85. Jackson D.N., Paunonen S.V., Fraboni M., Goffin R.D. A five-factor versus a six-factor model of personality structure. *Personality and Individual Differences*, 1996;20:33-45.
86. Jacobs R., Hofman D.A., Kriska S.D. Performance and seniority. *Human Performance*, 1990;3:107-121.
87. Jones C.J., Meredith W. Patterns of personality change across the life span. *Psychology and Aging*, 1996;11:57-65.
88. Jones S.J., Rabbitt P.M.A. Effects of age on the ability to remember common and rare proper names. *Quarterly Journal of Experimental Psychology*, 1994;47A:1001-1014.
89. Kausler D.H. *Learning and Memory in Normal Aging*. San Diego: Academic Press 1994.
90. Kay H. Learning of a serial task by different age-groups. *Quarterly Journal of Experimental Psychology*, 1951;3:166-183.
91. Kelley C.L., Charness N. Issues in training older adults to use computers. *Behaviour and Information Technology*, 1995;14:107-120.
92. Kite M.E., Johnson B.T. Attitudes toward older and younger adults: A meta-analysis. *Psychology and Aging*, 1988;3:233-244.
93. Kramer A.F., Larish J.L. Aging and dual-task performance. In W. A. Rogers, A. D. Fisk and N. Walker (eds.), *Aging and Skilled Performance*, Mahwah NJ: Erlbaum, 1996;83-112..
94. Kubeck J.E., Delp N.D., Haslett T.K., McDaniel M.A. Does job-related training performance decline with age? *Psychology and Aging*, 1996;11:92-107.
95. Kutscher R E, Walker J.F. Comparative job performance of office workers by age. *Monthly Labor Review*, 1960;83(1):39-43.
96. La Voie D., Light L.L. Adult age differences in repetition priming: A meta-analysis. *Psychology and Aging*, 1994;9:539-553.

97. Laflamme L., Blank V.G. Age-related accident risks: Longitudinal study of Swedish iron ore miners. *American Journal of Industrial Medicine*, 1996;30:479-487.
98. Laflamme L., Menckel E. Aging and occupational accidents: A review of the literature of the last three decades. *Safety Science*, 1995;21;145-161.
99. Laflamme L., Menckel E., Strömberg A. Age-related overexertion injuries among Swedish nursing auxiliaries over a 10-year period. *Work*, 1997;8:139-148.
100. Liden R.C., Stilwell D., Ferris G.R. The effect of supervisor and subordinate age on objective performance and subjective performance ratings. *Human Relations*, 1996;49:327-347.
101. Lindenberger U, Kliegl R, Baltes P.B. Professional expertise does not eliminate age differences in imagery-based memory performance during adulthood. *Psychology and Aging*, 1992;7:585-593.
102. Maher H. Age and performance of two work groups. *Journal of Gerontology*, 1955;10:448-451.
103. Mark J.A. Comparative job performance by age. *Monthly Labor Review*, 1957;80:1467-1471.
104. Marquié J.C., Paumes D. Age-related changes in visual information intake in a transcription task. *European Bulletin of Cognitive Psychology*, 1988;8:108-124.
105. Martocchio J.J. Age-related differences in employee absenteeism: A meta-analysis. *Psychology and Aging*, 1989;4:409-414.
106. Massey D., Campbell D. Accident involvement rates by age and gender. *UMTRI Research Review*, 1993;23(5):1-13.
107. Maurer T. J., Tarulli B.A. Investigation of perceived environment, perceived outcome, and person variables in relationship to voluntary development activity by employees. *Journal of Applied Psychology*, 1994;79:3-14.
108. Maylor E.A. Ageing and the retrieval of specialized and general knowledge: Performance of *Masterminds*. *British Journal of Psychology*, 1994;85:105-114.
109. McCauley C.D., Ruderman M.N., Ohlott P.J., Morrow J.E. Assessing the developmental components of managerial jobs. *Journal of Applied Psychology*, 1994;79:544-560.
110. McDaniel M.A., Schmidt F.L., Hunter J.E. Job experience correlates of job performance. *Journal of Applied Psychology*, 1988;73:327-330.
111. McEvoy G.M., Cascio,W.F. Cumulative evidence of the relationship between employee age and job performance. *Journal of Applied Psychology*, 1989:74:11-17.
112. McNaught W., Barth,M.C. Are older workers "good buys"? A case study of Days Inn of America. *Sloan Management Review*, 1992;33:53-63.
113. McRae R.R., Costa P.T. *Personality in Adulthood*. New York: Guilford Press 1990.
114. Morrell R.W., Echt K.V. Instructional design for older computer users: The influence of cognitive factors. InRogers W.A., Fisk A.D., Walker N. (eds.), *Aging and Skilled Performance*, Mahwah NJ: Erlbaum, 1996;241-265.
115. Morse C.K. Does variability increase with age? An archival study of cognitive measures. *Psychology and Aging*, 1993;8:156-164.
116. Mullan C., Gorman L. Facilitating adaptation to change: A case study in retraining middle-aged ond older workers at Aer Lingus. *Industrial Gerontology*, 1972;15:20-39.
117. Murray B., Gerhart B. An empirical analysis of a skill-based pay program and plant performance outcomes. *Academy of Management Journal*, 1998;41:68-78.
118. Myerson J., Hale S., Wagstaff D., Poon L.W., Smith G.A. The information-loss model: A mathematical theory of age-related slowing. *Psychological Review*, 1990;97:475-486.
119. Neely A.S., Bäckman L. Long-term maintenance of gains from memory training in older adults: Two three-and-a-half-year follow-up studies. *Journal of Gerontology: Psychological Sciences*, 1993;48:233-237.
120. Neely A.S., Bäckman L. Effects of multifactorial memory training in old age: Generalizability across tasks and individuals. *Journal of Gerontology: Psychological Sciences*, 1995;50B:134-140.

121. Noe R.A., Wilk S.L. Investigation of the factors that influence employees' participation in development activities. *Journal of Applied Psychology*, 1993;78:291-302.
122. Nordhaug O. Reward functions of personnel training. *Human Relations*, 1989;42:373-388.
123. Nyberg L., Bäckman L., Erngrund K., Olofsson U., Nilsson L-G. Age differences in episodic memory, semantic memory, and priming: Relationships to demographic, intellectual, and biological factors. *Journal of Gerontology: Psychological Sciences*, 1996;51B:234-240.
124. Olofsson M., Bäckman L. Influences of intentionality at encoding and retrieval on memory in adulthood and old age. *Aging Clinical and Experimental Research*, 1996;8:42-46.
125. Patrick J. *Training: Research and Practice*. London: Academic Press 1992.
126. Perlmutter M., Kaplan M., Nyquist L. Development of adaptive competence in adulthood. *Human Development*, 1990;33:185-197.
127. Plett P.C, Lester B.T. *Training for Older People*. Geneva: international Labour Office 1991.
128. Pulakos E.D., Borman W.C., Hough L.M. Test validation for scientific understanding: Two demonstrations of an approach to studying predictor-criterion linkages. *Personnel Psychology*, 1988;41:703-716.
129. Rabbitt P.M.A. An age-decrement in the ability to ignore irrelevant information. *Journal of Gerontology*, 1965;20:233-238.
130. Rabbitt P.M.A. Management of the working population. *Ergonomics*, 1991;34:775-790.
131. Rabbitt P.M.A. Crystal quest: A search for the basis of maintenance of practised skills into old age. In Baddeley A.D., Weiskrantz L.R. (eds.), *Attention: Selection, Awareness, and Control*, Oxford: Clarendon Press, 1993;188-230.
132. Rabbitt P.M.A., Maylor E.A. Investigating models of human performance. *British Journal of Psychology*, 1991;82:259-290.
133. Ree M.J., Carretta T.R. General cognitive ability and occupational performance. In Cooper C.L., Robertson I.T. (eds.), *International Review of Industrial and Organizational Psychology*,. London: Wiley, 1998;13:159-184.
134. Ree M.J., Carretta T.R., Teachout M.S. Role of ability and prior job knowledge in complex training performance. *Journal of Applied Psychology*, 1995;80:721-730.
135. Ree M.J., Earles J.A. Predicting training success: Not much more than g. *Personnel Psychology*, 1991;44:321-332.
136. Rogers W.A. Assessing age-related differences in the long-term retention of skills. In Rogers W.A., Fisk A.D., Walker N. (eds.), *Aging and Skilled Performance*,. Mahwah NJ: Erlbaum, 1996;185-200.
137. Rogers W.A., Fisk, A. D., Hertzog C. Do ability-performance relationships dfferentiate age and practice effects in visual search? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 1994;20:710-738.
138. Rouiller J.Z., Goldstein I.L. The relationship between organizational transfer climate and positive transfer in training. *Human Resource Development Quarterly*, 1993;4:377-390.
139. Salthouse T.A. Effects of age and skill in typing. *Journal of Experimental Psychology: General*, 1984;113:345-371.
140. Salthouse T.A. Speed of behavior and its implications for cognition. In. Birren J.E, Schaie K.W. (eds.), *Handbook of the Psychology of Aging*, second edition, New York: Van Nostrand Reinhold, 1985;400-426.
141. Salthouse T.A. The role of experience in cognitive aging. *Annual Review of Gerontology and Geriatrics*, 1987;7:135-158.
142. Salthouse T.A. *Theoretical Perspectives on Cognitive Aging*. Hillsdale NJ: Erlbaum 1991a.
143. Salthouse T.A. Mediation of adult age differences in cognition by reductions in working memory and speed of processing. Psychological Science, 1991b;2:179-183.
144. Salthouse T.A. Age and experience effects on the interpretation of orthographic drawings of three-dimensional objects. *Psychology and Aging*, 1991c;6:426-433.

145. Salthouse T.A. Speed mediation of adult age differences in cognition. *Developmental Psychology*, 1993a;29:722-738.
146. Salthouse T.A. Speed and knowledge as determinants of adult age differences in verbal tasks. *Journal of Gerontology: Psychological Sciences*, 1993b;48:29-36.
147. Salthouse T. A. Influence of working memory on adult age differences in matrix reasoning. *British Journal of Psychology*, 1993c;84:171-199.
148. Salthouse T.A. Aging associations: Influence of speed on adult age differences in associative learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 1994;20:1486-1503.
149. Salthouse T.A. The processing-speed theory of adult age differences in cognition. *Psychological Review*, 1996;103:403-428.
150. Salthouse T.A., Babcock R.L., Skovronek E., Mitchell D.R.D., Palmon R. Age and experience effects in spatial visualization. *Developmental Psychology*, 1990;26:128-136.
151. Salthouse T.A., Mitchell D.R.D. Effects of age and naturally occurring experience on spatial visualization performance. *Developmental Psychology*, 1990;26:845-854.
152. Salthouse T.A., Saults J.S. Multiple spans in transcription typing. *Journal of Applied Psychology*, 1987;72:187-196.
153. Saville and Holdsworth Ltd. *Motivation Questionnaire: Manual and User's Guide*. Thames Ditton, UK: Saville and Holdsworth Ltd. 1992.
154. Saville and Holdsworth Ltd. *OPQ Concept Model Manual and User's Guide*. Thames Ditton, UK: Saville and Holdsworth Ltd. 1993.
155. Schaie K.W. The course of adult intellectual development. *American Psychologist*, 1994;49:304-313.
156. Schaie K.W. *Intellectual Development in Adulthood*. Cambridge: Cambridge University Press 1996.
157. Schmidt F.L., Hunter J.E. Development of a causal model of processes determining job performance. *Current Directions in Psychological Science*, 1992;1:89-92.
158. Schmidt F.L., Hunter J.E., Outerbridge A.N., Goff S. Joint relation of experience and ability with job performance: Test of three hypotheses. *Journal of Applied Psychology*, 1988;73:46-57.
159. Schugens M.M., Daum I., Spindler M., Birbaumer N. Differential effects of ageing on explicit and implicit memory. *Aging, Neuropsychology, and Cognition*, 1997;4:33-44.
160. Schwab D.P., Heneman H.G. Effects of age and experience on productivity. *Industrial Gerontology*, 1977;4:113-117.
161. Schwoerer C.E., May D.R. Age and work outcomes: The moderating effects of self-efficacy and tool design effectiveness. *Journal of Organizational Behavior*, 1996;17:469-487.
162. Seyler D.L., Holton E.F., Bates R.A., Burnett M.F., Carvalho M.A. Factors affecting motivation to transfer training. *International Journal of Training and Development*, 1998;2:2-16.
163. Siemen J.R. Programmed material as a training tool for older persons. *Industrial Gerontology* 1976;3:183-190.
164. Simonton D.K. Age and outstanding achievement: What do we know after a century of research? *Psychological Bulletin*, 1988;104:251-267.
165. Simonton D.K. *Greatness: Who Makes History and Why?* New York: Guilford Press 1994.
166. Smith C.A., Organ D.W., Near J.P. Organizational citizenship behaviour: Its nature and antecedents. *Journal of Applied Psychology*, 1983;68:653-663.
167. Smith G.A., Brewer N. Slowness and age: Speed-accuracy mechanisms. *Psychology and Aging*, 1995;10:238-247.
168. Smith G.E., Petersen R.C., Ivnik R.I., Malec J.F., Tangalos E.G. Subjective memory complaints, psychological distress, and longitudinal change in objectve memory performance. *Psychology and Aging*, 1996;11:272-279.
169 Stankov L. Aging, attention, and intelligence. *Psychology and Aging*, 1988;3:59-74.

170. Sternberg R.J., Wagner R.K. (eds.) *Practical Intelligence: Nature and Origins of Competence in the Everyday World*. Cambridge: Cambridge University Press 1986.
171. Sterns H.L., Doverspike D. Training and developing the older worker: Implications for human resource management. In Dennis H. (ed.), *Fourteen Steps in Managing an Aging Workforce*,. Lexington: Lexington Books, 1988;97-110.
172. Stewart N., Sparks W.J. Patent productivity of research chemists as related to age and experience. *Personnel and Guidance Journal* 1966;45:28-36.
173. Straka G.A. Training older workers for and in the years after 2000. *Journal of Educational Gerontology*, 1990;5:68-78.
174. Swezey R.W., Llaneras R.E Models in training and instruction. In Salvendy G. (ed.), *Handbook of Human Factors and Ergonomics*, second edition, New York: Wiley, 1997;514-577.
175. Teiger C. Le vieilissement différentiel dans et par le travail: Un vieux problème dans un contexte récent. *Le Travail Humain*, 1989;52:21-56.
176. Tett R.P., Jackson D.N., Rothstein M. Personality measures as predictors of job performance: A meta-analytic review. *Personnel Psychology*, 1991;44:703-742.
177. Thorndike E.L., Bregman E.O., Tilton J.W., Woodyard E. *Adult Learning*. New York: Macmillan 1928.
178. Tracey J.B., Tannenbaum S.I., Kavanagh M.J. Applying trained skills on the job: The importance of the work environment. *Journal of Applied Psychology*, 1995;80:239-252.
179. Trites D.K., Cobb B.B. Problems in air traffic management III: Implications of training-entry age for training and job performance of air traffic control specialists. *Aerospace Medicine*, 1964;35:336-340.
180. Truett K.R. Age differences in conservatism. *Personality and Individual Differences*, 1993;14:405-411.
181. Van der Kamp, Veendrick, L. Different views on literacy. In Wildemeersch D, Finger M and Jansen T. (eds.), *Adult Education and Social Responsibility*, Frankfurt: Peter Lang, 1997;97-114.
182. Van Zelst R.H. The effect of age and experience upon accident rate. *Journal of Applied Psychology*, 1954;38:313-317.
183. Verhaegen P., Marcoen A., Goossens L. Improving memory performance in the aged through mnemonic training: A meta-analytic study. *Psychology and Aging*, 1992;7:242-251.
184. Verhaegen P., Marcoen A., Goossens L. Facts and fiction about memory aging: A quantitative integration of research findings. *Journal of Gerontology: Psychological Sciences*, 1993;48:157-171.
185. Verhaeghen P. Salthouse T. Meta-analyses of age-cognition relations in adulthood: Estimates of linear and non-linear age effects and structural models. *Psychological Bulletin*, 1997;122:231-249.
186. Walker J.F. The job performance of federal mail sorters by age. *Monthly Labor Review*, 1964;87(3):296-301.
187. Warr P.B. Age and employment. In H. C. Triandis, M. D. Dunnette and L. M. Hough (eds.), *Handbook of Industrial and Organizational Psychology*, second edition, volume four, 1994a; 485-550. Palo Alto: Consulting Psychologists Press.
188. Warr P.B. Training for older managers. *Human Resource Management Journal*, 1994b;4:22-37.
189. Warr P.B. Age, work, and mental health. In Schaie K.W., Schooler C. (eds.), *The Impact of Work on Older Adults*, New York: Springer, 1997:252-296.
190. Warr P.B. Logical and judgemental moderators of the criterion-related validity of personality scales. Submitted for publication 1998.
191. Warr P.B., Allan C. Learning strategies and occupational training. In Cooper C.L., Robertson I. T. (eds.), *International Review of Industrial and Organizational Psychology*, London: Wiley, 1998;13:83-121.

192. Warr P.B., Allan C., Birdi K. Predicting three levels of training outcome. Submitted for publication 1998.
193. Warr P.B., Birdi K. Employee age and development activity. *International Journal of Training and Development*, in press 1998.
194. Warr P.B., Bunce D. Trainee characteristics and the outcomes of open learning. *Personnel Psychology*, 1995;48: 347-375.
195. Warr P.B., Pennington J. Views about age discrimination and older workers. In Institute of Personnel Management (eds.), *Age and Employment: Policies, Attitudes and Practices*,. London: Institute of Personnel Management, 1993;75-106.
196. Warr P.B., Pennington J. Occupational age-grading: Jobs for older and younger non-managerial employees. *Journal of Vocational Behavior*, 1994;45:328-346.
197. Welford A.T. Changes of performance with age: An overview. In Charness N. (ed.), *Aging and Human Performance*, Chichester: Wiley. 1985;333-369.
198. Wilkniss S.M., Jones M.G., Korol D.L., Gold P.E., Manning C.A. Age-related differences in an ecologically based study of route learning. *Psychology and Aging*, 1997;12:372-375.
199. Willis S.L. Improvement with cognitive training: Which old dogs learn what tricks? In Poon L.W., Rubin D.C., Wilson B.A. (eds.), *Everyday Cognition and Late Life*, Cambridge University Press, 1989;545-569.
200. Zelinski E.M., Burnight K.P. Sixteen-year longitudinal and time lag changes in memory and cognition in older adults. *Psychology and Aging*, 1997;12: 503-513.

2.2 Attitudes, strain and work ability during a 2-year educational program in industry.

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An educational training program was started in seven industrial enterprises in autumn 1995. The main aim of the program was to develop team work skills among the employees. The aim of the follow-up study was to investigate the changes in attitudes, strains and work ability during the 2-year program.

The study population consisted of 1876 workers in food, metal, clothing and shoe industry. In all 1573 persons (84%) responded to the first questionnaire and 1241 persons after 2 year. The subjects included 64% women. The age of the subjects ranged from 17 to 64 years and about 21% were below 29 years and 18% above 50 years of age. The questionnaire included questions e.g. about the workers conception of group's spirit, growth motivation, commitment to work etc. ("Preconditions for team work", Ruohotie 1994). The strain during work and work ability (Tuomi et al.1991) were estimated on specific scales.

The results showed differences between the age groups (<30, 30-39, 40-49 and >50 years) already in the base-line. The group spirit and growth motivation were lower after the age of 50 years than among the younger ones. However, the older workers had a firmer commitment to the work community and higher appreciation of the contents of work. Most of the preconditions for team work (e.g. growth motivation, team spirit) increased during the 2 years, especially among those above 50 years of age. There were only minor changes in the perceived strain during work. The perceived stress increased among the workers in the youngest but decreased in the oldest group. The work ability increased especially among those above 50 years of age.

The results suggest that the educational program had a positive effect on attitudes and work ability, especially among the older workers.

References

1. Ruohotie P. Professional updating. In: Ruohotie and Grimmet, ed. *New themes for education in a changing world*. Career Education Books, Saarijarvi, 1994:167-205.
2. Tuomi K, Ilmarinen J, Eskelinen L, Järvinen E, Toikkanen J, Klockars M. Prevalence and incidence rates of diseases and work ability in different work categories of municipal occupations. *Scand J Work Environ Health* 1997;suppl 1:67-74.

2.3 Working conditions of older workers and their impact on learning and skill development.

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The impact of demographic changes on the working life and the question of how future economic development can be managed with a generally ageing workforce are being discussed with increasing regularity in the Federal Republic of Germany. Both experts and politicians responsible for employment policies consider that maintaining employability and secure training opportunities for older workers plays a vital role to be able to encounter the forthcoming challenges. At present, the employment prospects of this group of employees in Germany are endangered because of skills deficits which arise in the course of work life. Referring to different research projects four main risks for disqualification which older workers face can be identified:

- Devaluation of existing skills: Their acquired skills and competencies may become devalued as new technologies are introduced.
- Loosing acquired skills: Older workers may even lose acquired skills and their versatility may decline because they only perform certain limited tasks at their job.
- Intergenerational skill-level differences: Older cohorts of workers in general have a lower level of education than younger ones.
- Age-specific skill changes: Differences in cognitive ability between younger and older workers may lead to disadvantages of older workers in adapting new technologies.

These risks can be identified in the manufacturing sector as well as in the service sector but differentiations between small or medium sized firms and large-scale enterprises as well as between tayloristic working conditions and companies with higher skill levels have to be observed. Last but not least gender differences have to be taken into consideration.

Any improvement in this situation must primarily be company-led and company-based policies must be at the core of the innovations that are required. To prevent skill deficits among older workers and to raise the level of participation of older and ageing workers in vocational training schemes, it is necessary to:

- Create a learning environment at the workplace.
- Develop workplace-based training schemes.
- Combine working-time arrangements and training to promote a continuous process of training.
- Design training courses that are effective in the teaching older people.

The Institute of Gerontology identified 19 organizations which had taken appropriate positive measures to train older workers or to let them participate in existing training pogrammes. One company that comes nearest to a holistic approach enables older workers to stay as productive as younger workers when introducing new forms of production. This was achieved by a formal agreement that older workers must be integrated into these new forms of production, special training measures for older employees and supporting training for managerial functions.

2.4 Too old to learn? Educational activities of older workers.

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'Lifelong Learning for all', was the ambitious message of the OECD to the industrialized countries in 1996 (OECD 1996). *'Learning: the treasure within'*, so was the romantic title of a report of Jacques Delors written for Unesco in 1997 and the European Union declared 1996 as *'the Europeen year of Lifelong Learning'*.

Rhetoric or reality? That is one of the questions I will try to answer in my paper. The dominant rationale behind the lifelong learning policy in many countries (e.g. the Netherlands) is the 'employability' of the workforce. Because of globalization and international competitiveness the ageing workforce has to remain flexible. Education and training is seen as one of the main instruments within this policy.

The data of the International Adult Literacy Survey (IALS) give the opportunity to show the current educational participation in a number of countries (Van der Kamp & Scheeren 1997). When the older workers are compared to their younger colleagues a slight decrease of learning activities becomes visible in the agegroup from 46 to 55 years old. After the age of 55 there is a clear decline in learning activities of workers, especially in Switzerland, the Netherlands and Poland. Sweden shows a more stable pattern. In the total sample of adults in the IALS-data there is a strong relationship between the level of initial education and participation in continuous education and training. Also in the case of older workers it is obvious that there is a high correlation between the level of initial education and lifelong learning.

What are the reasons for the low participation of older workers with little formal education? Thijssen (1988) distinguishes three relevant domains of variables as possible impedients or stimulants of learning: (a) the variety of someone's work experience, (b) someone's learning strategies, and (c) his or her social and cultural environment. Small experiences in these domains might lead to less flexibility in discontinuous transformations on the workfloor, e.g. technological innovations, mergers etc. when new competencies or an up-grading of skills is needed.

Many older workers with little formal education often work in so-called 'dead end jobs', that cause limited experiences in all three domains. This makes them vulnerable in terms of employability. From different perspectives they were not stimulated to learn. From a macro-policy perspective as long as there was money to pay exit arrangements; from an organizational perspective as long as there were cheaper youngsters to replace them; and from the perspective of older employees themselves because of conditions of work, work load and attractive exit benefits. In my paper this will be illustrated with some qualitative research. In the years to come, however, demographic and economic constraints will change these perspectives radically. So, the challenge will be how older workers with little formal education might be stimulated to participate in lifelong learning on a policy level, an organizational level and an individual level. In my paper I will show an example of an integrated personel and learning approach.

2.5 State of the art on mental work ability and an increasing (work) life span of people.

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Mental workability is composed of the following factors: 1) processes required for information processing, 2) the 'carriers' for such processing: memory and attention, 3) the subjective interpretation (emotions) and preparedness to act (effort and motivation), factors which all contribute to 4) personality type. All these aspects are prone to change over the lifespan, not just losses: structural decline but also gains: life experiences and expertise skills.

At a young age knowledge is gained about facts and procedures, in adulthood the emphasis is on the application of established knowledge: skills and experience, and the integration of new and existing knowledge. This latter style of functioning makes information processing skills automated, less time consuming and less effortful. This condensed knowledge (skills and abilities) is a better starting point for development (learning) at later age than application of cognitive abilities that require effortful processing.

Discussions on ageing are usually restricted to the phase in which changes become visible in terms of deterioration of function, both physically and mentally. A more objective approach is speaking about changes over the lifespan. In following the Piagetion stages it is established that there are early periods of rapid development in childhood, a learning and experiencing phase which is prolonged in young adulthood and only in adolescence signs of decrease of function become manifest. In this cycle of change a confounding factor is disuse of function. Whenever knowledge is gained or abilities are learned, not using them for a while usually means forgetting and, reduction of efficiency and automation. Generally disuse of cognitive function with advancing age is often confused with biological effects of ageing. Whereas effects of unhealthy ageing may interact with the normal ageing process. For example a brain injured person may show early signs of ageing. On the other hand mechanisms such as compensation, deliberate use of strategy and coping (putting more effort into a job) may to a large extent and to an advanced age be useful in maintaining an adequate style of performance.

The lifespan can be considered as a continuum of development from adulthood into senescence. A variety of life events may affect the life cycle positively or negatively. Personal development, education and a job career are among such events. Also general health and the onset and progression of the ageing process are major determinants.

It is hardly possible to map the pattern of determinants involved, however a general principle is that the lifespan and a professional career take place with continuous change (growth and decay) of effectiveness and power of capacities.

From many classical textbooks on ageing it may be concluded that in laboratory settings major effects of ageing are measured. However laboratory conditions and experiments have usually little relevance for work, and research in work conditions not always have relevance for functioning in daily life. These conclusions have to do with the validity of ageing studies. In daily life an individual may choose what to do (ignore tasks and activities which are difficult and complex, instead activities (e.g. hobbies) are chosen which are over-learned and highly experienced. Working can be expressed in the terms of information processing. The processes are sensitive for ageing and affect practical functioning. Ergonomic adaptations at the workplace can largely compensate shortcomings (Table 1).

Table 1. Information processing, ageing and adaptation: some basic principles and examples

INFORMATION-PROCESSING	PRACTICAL EFFECT	ADAPTATION OF THE WORK ENVIRONMENT
sensory	clarity of information uptake: signal-to-noise ratio; distinction relevant/irrelevant information; visual clarity, simplicity of information	amplify signals, reduce noise; improve clarity of visual and auditory signals;
sensory-perceptual	sensory storage capacity, processing capacity; logic and uniformity of presented information	simplicity and uniformity of information; reduce disturbance
cognition	memory and attention functions (working memory capacity), capacity for reasoning, problem solving	reduce complexity; apply individual expertise and knowledge; apply familiar concepts; improve logical relations
motor preparation	stimulus/response relation; preparation for action	apply direct stimulus-response relations; apply logical and compatible choices
motor execution	response speed, accuracy of response	apply enforcement of movement (electronic) aids in order to simplify choice

In a workforce with an increasing average age it is often discussed how proactive policies can be designed and implemented in work organisations. Here lies a dilemma, since anticipation of change usually demands some kind of investment the revenues of which may only be seen after many years. Therefore proactive age-related policies specifically aimed at individual changes over time are rarely seen. From this perspective training and education are the tools for improving the quality of future work. The ability to learn is of major importance. As information processing abilities change over the lifespan it is evident that learning abilities also change. Accordingly deprivation of learning may affect the motivation to study. Learning abilities are related to intellectual capacities, personal style and effectiveness and preferences in learning strategy. Preparing for modern work at later age requires learning efficiency taking into account the factors as stated above.

Age-related policies entail more than creativity with retirement schedules or work flexibility programs. Ageing has not the same significance for a present and past 'old' cohort. Over time changes take place both in the nature of work and in attitudes towards an ageing workforce. Modern work (e.g. information technology) increases mental demands of work and the general attitude towards older workers becomes friendlier and more tolerant. Lifelong learning at work can be applied as a successful strategy against changes in the nature of work and individual changes over the lifespan.

3. Work ability and health

3.1 Maintaining work ability and health among the middle-aged and elderly.

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Introduction.

The mean age of the population has increased steadily during the 19th century in most countries. In Finland, the mean age increased from 28 to 39 years from 1920 to year 2000. In year 2020 it is predicted to reach the level of 43 years and then show a downward trend for several decades. One consequence is, that the mean age of the working population is also increasing in the near future. The baby boom cohorts are today 45-50 years old and constitute the largest part of the personnel in most companies. In year 2005 the same cohorts are 55-60 years old and, with a high propability, form the largest part of the manpower in many companies. This will come true in spite of the fact that both incidence of work disabilities and unemployment will reduce the number of older worker in the coming 10 years. The main reason for a large proportion of older worker in 2005 is that there will not be enough young worker who could substitute the older ones. Therefore, many companies will experience an older age-structure than ever before in their history.

The problems with aging in modern working life can be described both at individual, enterprise and society levels. Correspondingly, the solutions and results of actions can be identified at three levels. A matrix describing the problems, solutions and results at individual, enterprise and society levels has been worked out recently (Figure 1). The aim of the matrix is to convince all partners that the problems can be solved with good results. However, it also emphasizes that strong interactions exist between the individual, enterprise and society and they all are needed for solving the problems. The key level is the enterprise level, because they have a culture of their own and rules for employing and supporting their manpower. The new situation with older manpower affects the company culture and specially leadership and management styles. The time for necessary changes is getting short.

FinnAge Program 1990-1996.

Based on results of longitudinal studies among aging workers since 1981 (Ilmarinen et al. 1991, Tuomi et al. 1997) the Finnish Institute of Occupational Health carried out a multidisciplinary research program in 1990-1996 called FinnAge - Respect for the Aging. The aim of the program was to promote the health, work ability and well being of the aging (45+) worker. The program included 25 different research projects in industry, state and municipal sectors in Finnland. Also three handbooks were published for the university level as well as for occupational health and safety personnels (Figure 2). The final report of the FinnAge-program is under preparation. In the following, the issues of maintaining work ability and health is based mainly on the results of our 11-year follow-up studies of aging workers and on the experiences of the concept used in several FinnAge projects both in private and other sectors.

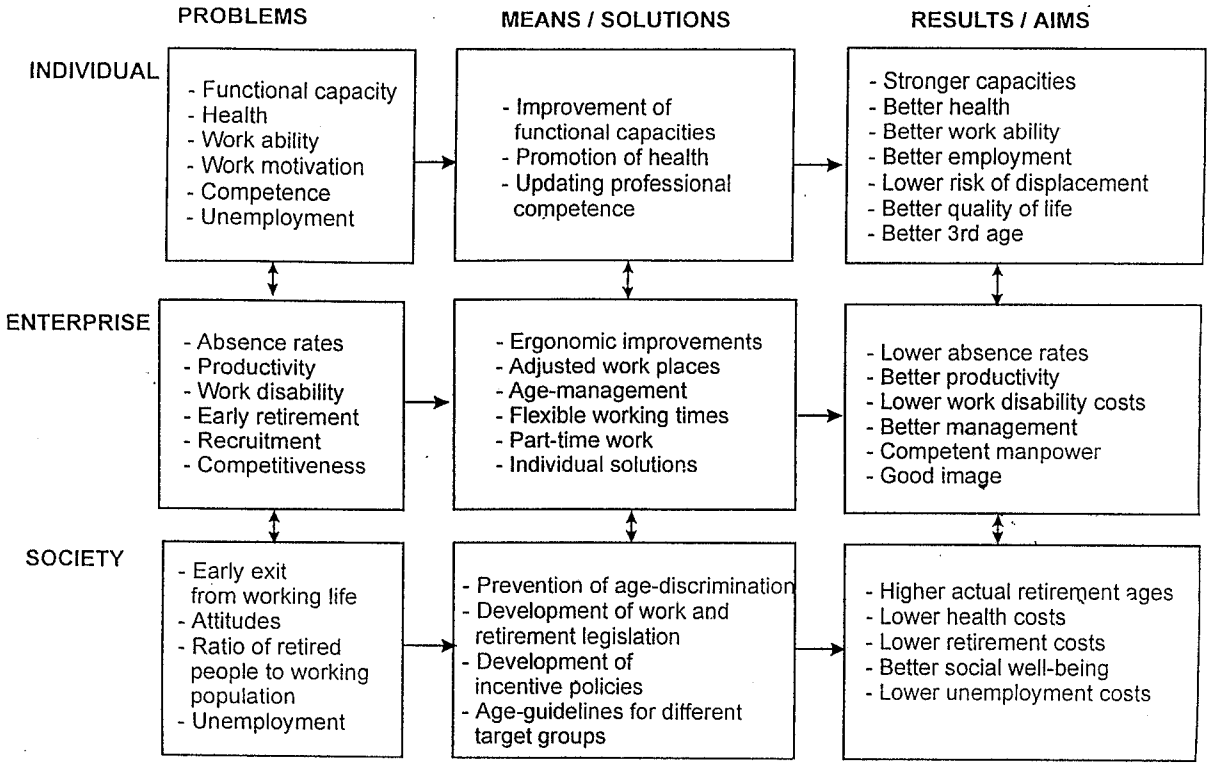

Figure 1. Problems, solutions, and possible results of the actions directed to the aging work force at individual, enterprise and society levels.

FINNAGE - RESPECT FOR THE AGEING PROGRAM 1990-1996

Projects

Training Material

- A handbook on Aging and Work Kuusinen et al. 1994
- Work ability and wellfare from exercise Korhonen et al. 1995
- Good work ability A Handbook of Promotion of Work Ability Matikainen et al. 1995

Attitudes

- Employees attitudes towards early retirement and work (1990, 1992,1994) Huuhtanen et al.
- Employers attitudes toward early retirement Huuhtanen et al.
- Cooperation: young vs. old Huuhtanen et al.

Industry

- Metals (5)
- Construction Matikainen et al.
- Clothing Kirjonen et al.
- Post and Teleservice Tulkki et al.

State

- Firefighters (2) Lusa et al. Punakallio et al.
- Cleaners Hopsu et al.
- Teachers Parkatti et al.
- Policemen Soininen et al.
- Vehicle inspectors Louhevaara et al.

Municipal

- Home care personnel Pohjonen et al.
- Pipe and rail fitters Louhevaara et al.
- Health care personnel Malmivaara et al.
- Information technologist Seppälä et al.
- Midwifes Kandolin et al.
- 11-year follow-up studies (5) (1981-1992)

Figure 2. Content of the FinnAge-Respect for the Aging Program

Aging and health.

In general, it is a wellknown fact that the prevalence and incidence of several diseases increase with age. More important is to know which diseases show a notable increase during working age, how the workers perceive and cope with the changes in health, and what are the adjustments needed at work sites due to the changes in health. The prevalence rates of musculoskeletal diseases seem to increase to a high level during working age (Figure 3). About 31% of 44-48 year old female workers in a wide range of occupations had at least one diagnosed musculoskeletal disease (e.g. upper back, lower back, sciatica, rheumatoid arthritis etc.). Eleven years later, aged 55-59 years, 56% of the same cohort of females had a musculoskeletal disease. Similar increases in prevalence rates was seen among the males, from 27% to 50%, respectively. The increase in 11 years is smaller in older cohorts, but all the cohorts are entering the level of 50% concerning the musculoskeletal disorders. Also the prevalence of cardiovascular diseases show a remarkable increase in all studied age cohorts of females and males during the work career. As a consequence, the number of healthy people (no diseases diagnosed by physician) is getting much smaller with advancing age. At 44-58 years of age 29-42% were healthy, at age of 55-69 years the proportion of healthy had shrinked to 14-18% (Figure 4). So, a large majority of the workforce over 55 years had to cope with diseases.

The perceived health was related to diagnosed diseases as the cohort got older. About age 50, the health was perceived "decreased" in spite of the fact that no diseases were diagnosed (Figure 5). At that age a good health was perceived only by 11% of the subjects without diseases. When getting older, around 60 years of age, 42% of subjects perceived their health "good" when without diseases. So, the meaning and content of health changed in ten years and the presence or absence of diseases played a more important role when 60 than 50 years old.

The changes in diagnosed and perceived health should have strong implications in working life. The first consequence is, that the content of work, work tasks or working methods should also change with changing health status. However, in praxis a changing health is not systematically adjusted by changes at work. Therefore, poorer health can be a reason why the persons may be set aside from work, although he or she could continue work with appropriate adjustments. Another point is that the changing age structure causes a marked increase in health problems in the coming 10 years. Therefore, the role of occupational health services are strongly emphasized in the future. A consequence is, that the companies must invest much more for occupational health services because there will be a much greater demand on health services among workers than ever before. Occupational health services are becoming one key function to guarantee the productivity and well-being of the older work force.

Aging and work ability.

The ability to work is a complex set of different factors. Additionally, the factors influencing individual abilities to work are dynamically changing with advancing age. Based on our longitudinal results and experiences of several FinnAge projects a "process scheme" of factors leading to work ability has been constructed (Figure 6). This scheme indicates that work ability at the individual level is based on functional capacities and health. The basics for work ability has then been made more complete by appropriate training and education by improving the skills and knowledge at school level and later throughout the working life. All this is converted into our personal capital - professional competence. But professional competence is not the same as work ability. Two additional factors are playing an essential role in

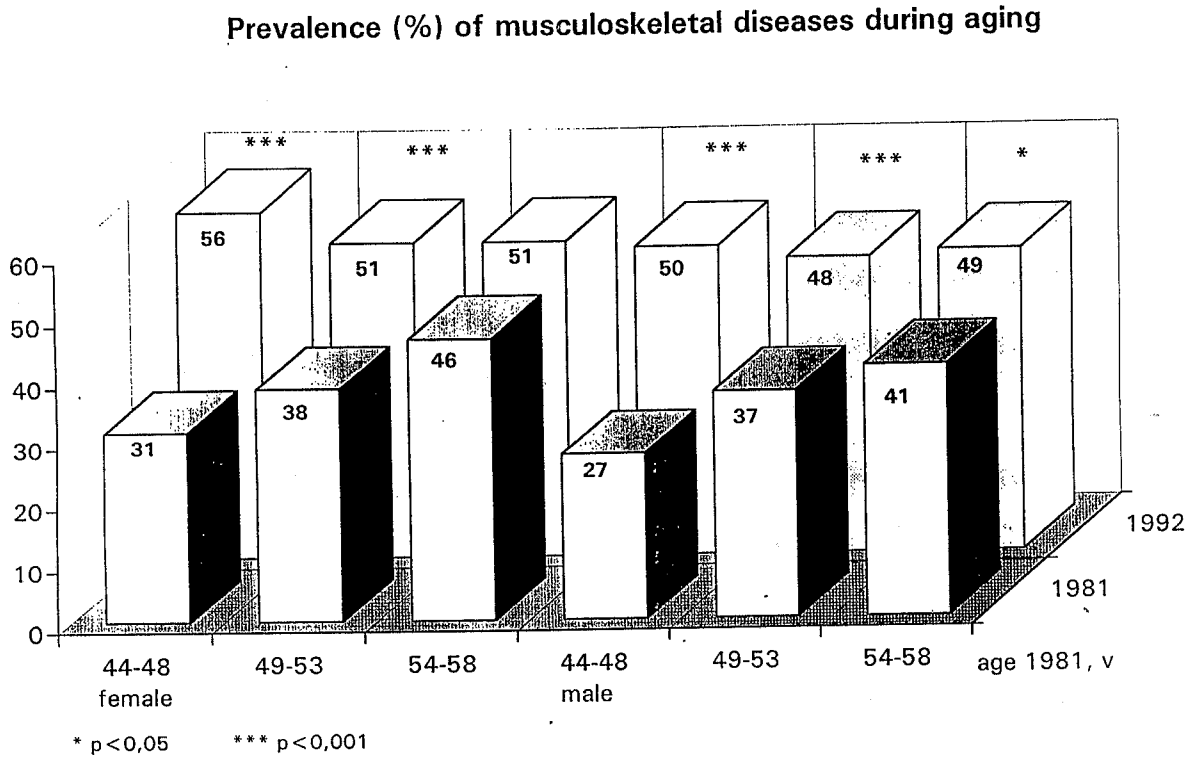

Figure 3. Prevalence (%) of musculoskeletal diseases during aging among the men and women.

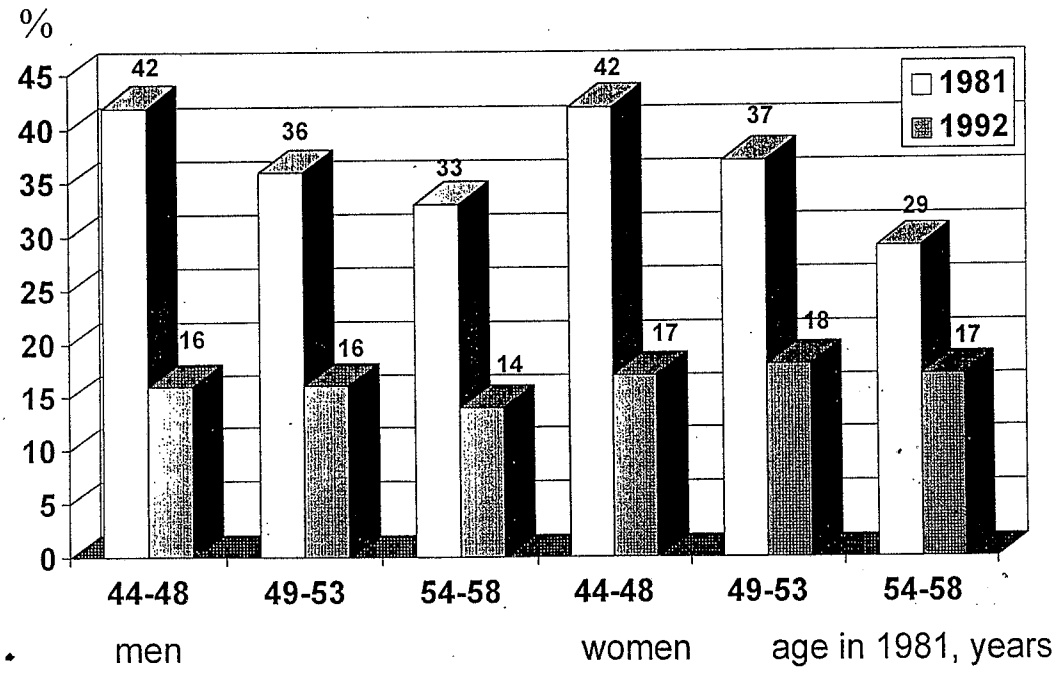

Figure 4. Proportion (%) of healthy subjects (no diagnosed diseases) by gender and age group in 1981 and 1992.

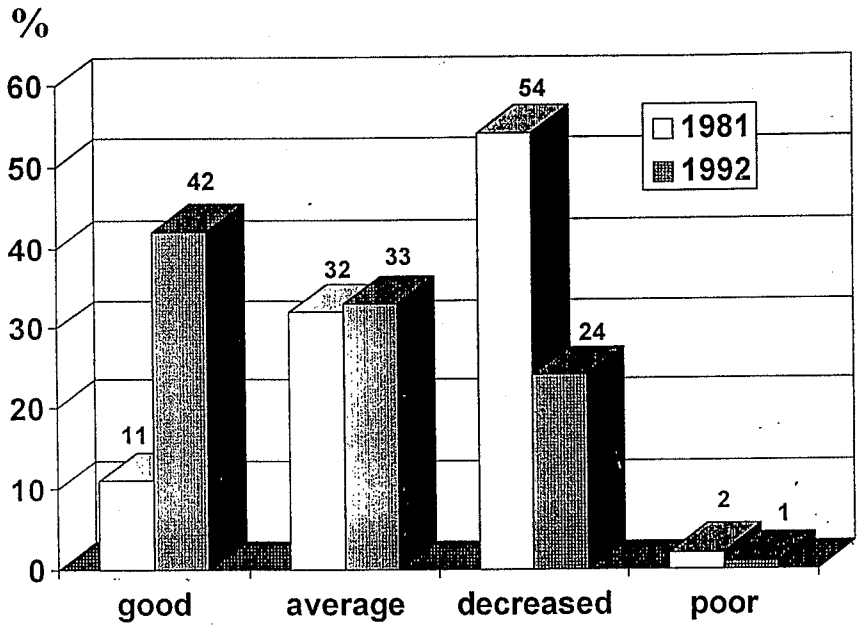

Figure 5. Distribution of perceived health in 1981 and 1992 among the subjects who had no diagnosed diseases.

FUNCTIONAL CAPACITY, PROFESSIONAL COMPETENCE AND WORK ABILITY

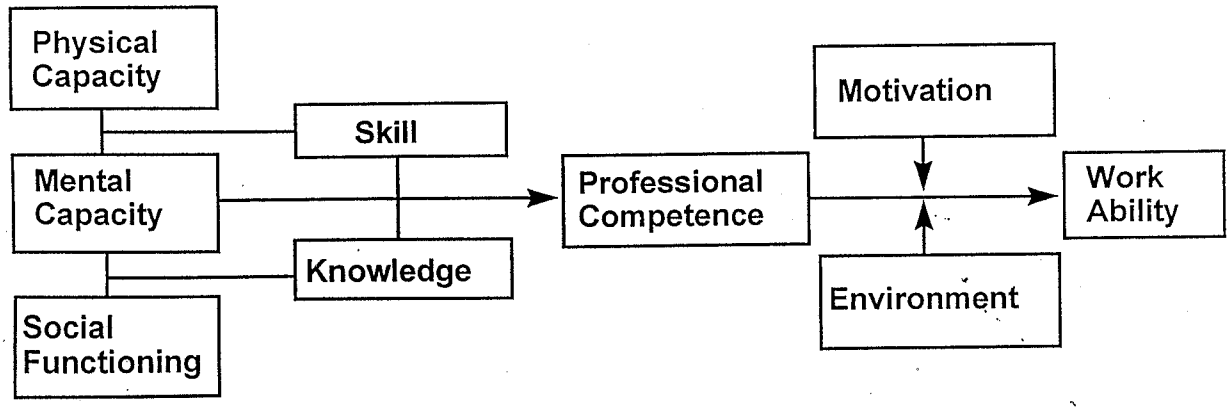

Figure 6. Functional capacity and health, skill and knowledge, work environment and worker motivation in the process of work ability.

constructing the work ability. Operational environment includes both the physical, mental and social properties of work environment. Environment in the broad sense, in qualitative and quantitative terms, is most decisive for a good ability to work. It includes e.g. all ergonomic and organizational aspects of adjustments needed at work sites for older workers. If no adjustments to enhance the work environment have been made, the work ability can be poor although the professional competence is good. It is worth noting that e.g low productivity is more the results of poor work environment and organisation than an individual cause (Shephard, 1993). The "black box" in the process scheme is the motivation. It is surely influenced by professional competence and work environment but also dependent of several factors outside working life. Between competence, environment and motivation exist strong interactions which are summed up as work ability (see Fig. 6). This scheme emphasizes that influencing the work ability is a complex process and presupposes several actions. If one of the processes enhancing health and capacities, skills and knowledge or work environment is neglected, the outcome will be a loss.

Aging and Work Ability Index.

The promotion and maintenance of work ability presupposes that the work ability can be measured. We constructed a work ability index for epidemiological research purposes in the beginning of the longitudinal study in 1981. It was based on the cross-sectional data of about 6500 subjects from a large variety of municipal occupations. The work ability index was derived as the sum of the scores of 7 items (Table 1). The range of the summative index is 7-49, which was divided into four categories: poor, moderate, good and excellent work ability (Tuomi et al. 1991, Tuomi et al. 1994, Ilmarinen et al. 1997).

The 4-year and 11-year follow-up studies indicated that the classified work ability index (WAI) well predicted retirement on disability pension, and also mortality. Of those whose work ability in 1981 was poor, 62.2% had retired on disability pension, 11.6% had died, and only 2.4% continued to work full-time in 1992 (Figure 7) (Tuomi et al. 1997). The WAI is nowadays a practical tool for occupational health services to

(i) identify subjects who risk losing the work ability early,
(ii) plan and tailor appropriate actions for promoting work ability,
(iii) measure the effectiveness of actions taken. The WAI has nowadays been translated to Chinese, Dutch, English, Esthonian, German, Portuguese, Russian and Swedish Languages and several other translations are in preparation.

Our follow-up data showed that the mean values of WAI declined significantly from age 45 to age 61 years and the standard deviations became larger. The speed of decline of WAI in 11 years was not strongly related to age. However, a trend was seen in that the speed of decline was slowest at 45 years of age among the men and fastest among the women at 51 years of age. Furthermore, the mean WAI was systematically higher in mentally than in physically demanding work. During the 11-year follow-up the WAI declined in 28.9% and improved in 9.2% of the subjects. Age was not significantly associated with declined or improved WAI. Also, the work content (physical, mixed or mental work), was not significantly associated with declined or improved WAI among the men or women. However, when analysing the changes in classified WAI scores, work-related differences during aging was seen. The prevalences of poor work ability (WAI scores between 7-27 scores) increased more steeply from age 51 to age 58 years among subjects in physical than in mixed (physical and mental) or mental jobs, especially among women (Figure 8). Prevalences of poor WAI by age, gender and type of work indicated furthermore, that in kitchen supervision, auxuliary

Table 1. Work ability index.

	SCALE
1. Work ability related to the life's best	0-10
2. Work ability related to work demands	
– physical work	1-5
– mental work	1-5
3. Nr. of chronical diseases	1-7
4. Handicap due to the diseases	1-6
5. Sick absence	1-5
6. Prognose for the next 2 years	1-7
7. Mental resources	1-4
	Range 7-49

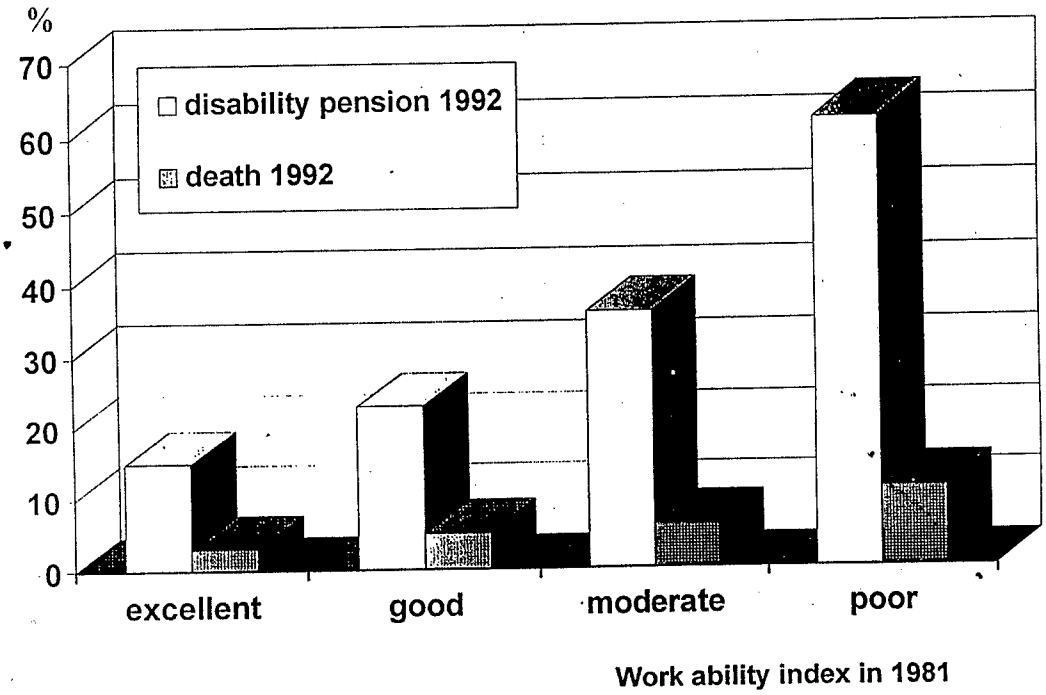

Figure 7. Work Ability Index predicting death and work disability pensioning of municipal workers in 1981-1992. Classsification: poor = 7-27, moderate = 28-36, good = 37-43, and excellent = 44-49 points.

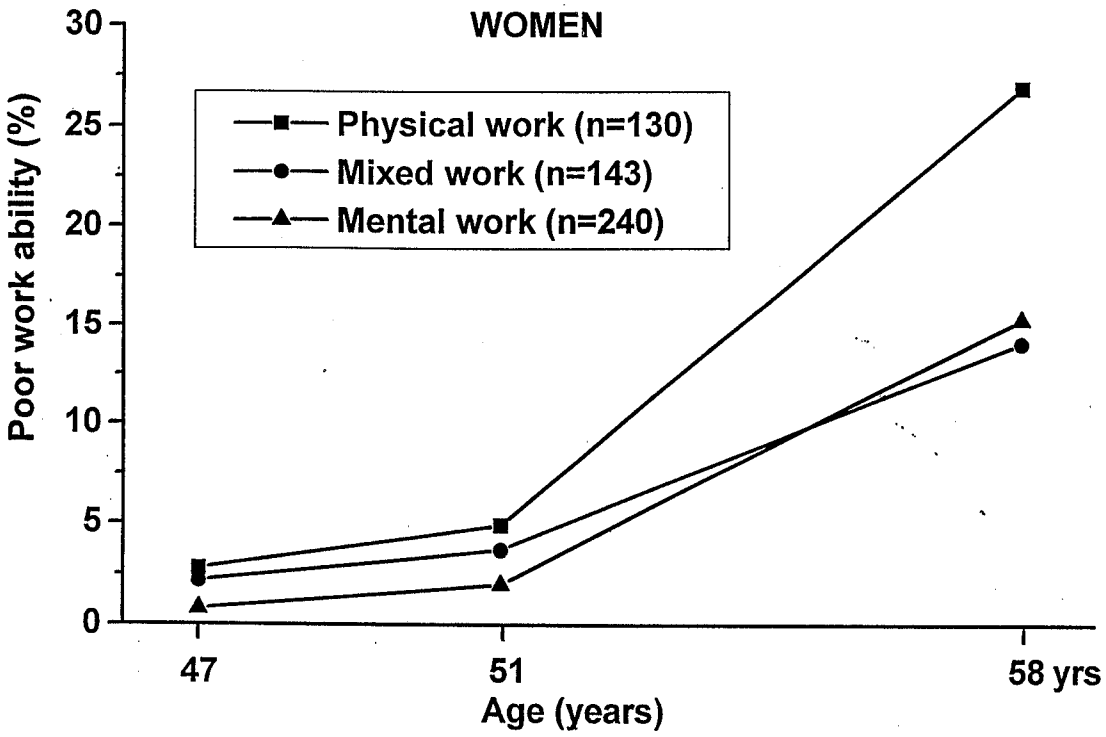

Figure 8. Distribution of the women in the poor category of work ability index by type of work and age.

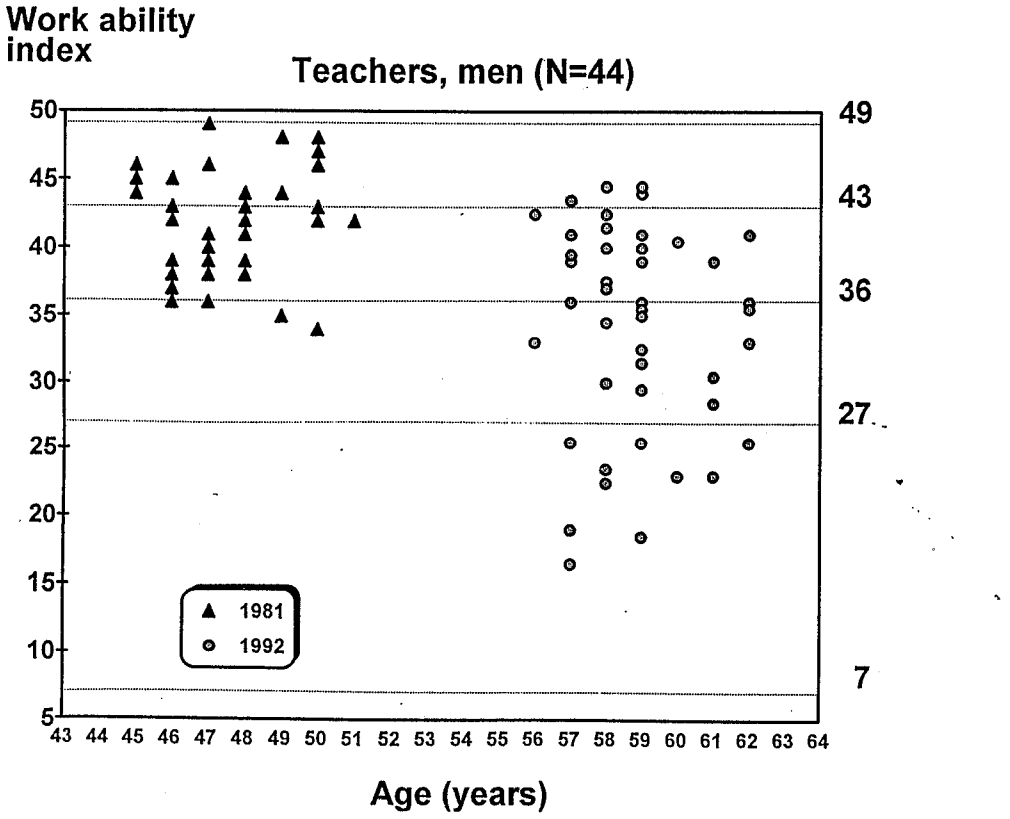

Figure 9. Individual scores of the work ability index of the men in teaching work by age.

work and home care work among the women and installation, auxiliary and transport work among the men, the rates exceeded 25% at age 58 years. Multiple differences in prevalence rates of poor WAI were observed between the "best" and "worst" type of work and these differences were produced during the age range of 51-58 years (Ilmarinen et al. 1997). This information is valuable because it helps to focus the early actions to such occupational groups where the risk of poor work ability and work disability is the highest in advancing age. Special attention is needed to decrease the physical work load of older workers, specially among the women.

Another important finding is the increase of individual differences with age. As one example, the WAI scores of individual male teachers is shown in figure 9. In the age range 45-51 years the teachers look as a rather homogenous group; most of them had a good or excellent work ability score. But 11 years later, the same group looks very heterogenous according to their WAI scores. The number of teachers in the moderate and poor class of WAI had dramatically increased. Within the chronological age of 57 or 59 years, the WAI scores vary from excellent to poor (Figure 9). This finding suggest that chronological age is not a good characteristic of the older employee. A much better characteristic is e.g. his/her work ability score. Therefore, we should emphasize that age as such should not be used to evaluate the older workers. Another consequence is, as shown by the wide deviation of male teachers, that more individual solutions are needed with advancing age. We are becoming more and more different e.g. in respect to physical and mental capacities and to social functioning with advancing work career, meaning that also the adjustments needed at work are more individual than ever before during our working life.

Maintaining and promoting the work ability.

Based on the 11-year follow-up studies a model was constructed for identifying factors associated with the improvement in work ability during aging. The results of this logistic regression model is shown in Table 2. This model emphasizes that improvements in supervisors attitude, decrease in repetitive movements and increase in vigorous physical exercise in leisure time were the key factors explaining the improvements in WAI (Table 2).

Based on this model and on the experiences of several FinnAge projects a basic concept for maintaining and promoting work ability was created. The concept is introduced in the form of a pyramid (Fig. 10). The pyramid symbolizes one of the oldest and most timeless constructions in the world. Its corners and top symbolize the four key-actions needed for work ability- promotion during aging: namely (i) promotion of health and functional capacities, (ii) adjustments of physical work environment, (iii) adjustments of psychosocial work environment, and (iv) updating of professional competences.

Health promotion includes actions taken by the older workers themselves as well as by the experts of occupational health services. A good praxis in occupational health services means both a good treatment of diseases and support of healthy life styles. In general, occupational health service is often a key function in planning and carrying out the activities of work ability promotion. At the individual level the care of functional capacities is, however, our own responsibility. The decline of physical working capacity happens first and its premature decline should be prevented. Regular physical exercise was revealed in the regression model as an important factor explaining the improvement of WAI. Therefore worksite exercise programmes for beginners and for physically passive employees should be developed. The regularity is the key element, not the intensity or duration of physical activities for older workers. Through a modest increase in daily activity, most people can improve their health and quality of life (CDC 1996). Regular physical activity affects both physical, mental and social work abilities. Interestingly, about 90% of a representative sample of Finnish citizens

Table 2. Model of work and life-style factors associated with an improved work ability [illegible] (N=555) - odds ratios (OR) and 95% confidence intervals (95% CI) of the logistic regression model.

Variable	OR	95% CI
Repetitive movements [b]		
Not decreased	1.0	
Decreased	2.1	1.0 - 3.4
Satisfaction with supervisor's attitude [b]		
Not increased	1.0	
Increased	3.6	1.8 - 7.2
Vigorous physical exercise in leisure time [b]		
Not increased	1.0	
Increased	1.8	1.0 - 3.5

[a] The score in the work ability index had improved at least three points from 1981 to 1992.
[b] Change from 1981 to 1992.

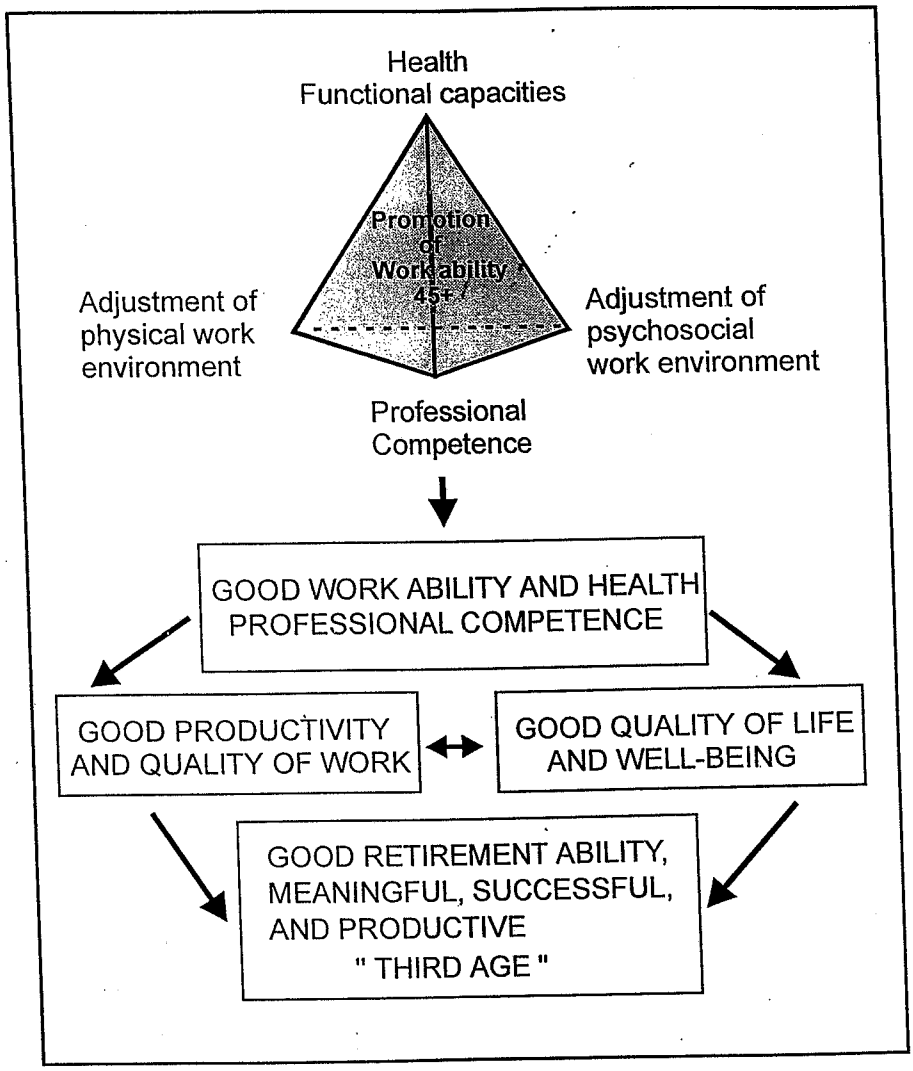

Figure 10. Basic concept for promotion of work ability during aging.

reported that regular and brisk exercise improves their mental work ability; in the same study about 70% reported that regular exercise was beneficial for physical work ability and about 60% that it was beneficial for social work ability.

The left corner of the pyramid includes actions for adjusting mainly the physical demands of work to the worker. The decrease of physical work load focuses both on whole body and local load. A normal, age-related decline in physical working capacity should be taken into consideration. It should be remembered here, that the prevalence of musculoskeletal disorders among workers over 55 years are very common. Therefore the possible impairment due to diseases should be compensated e.g. by slowing down the work pace or changing work methods. The regression model suggested, that the decline of repetitive movements explained the improvements of WAI. New work-rest schedules are needed, too. The recovery times are dependent of the work load level: the heavier the work load, physically or mentally, the longer recovery times are needed. The recovery time is also increasing with age. Therefore new concepts of e.g. micro-pauses and work-rest schedules are needed for older workers. Another topic is the ergonomic adjustments for sensory organs needed for slower psychomotor performance of older worker. Examples of adjustments to enhance the workplace environment has been given e.g. by Spirduso (1995).

The right corner of the pyramid calls for adjustments to enhance the psychosocial work environment. Worker satisfaction with supervisors´ attitude was emphasized in the regression model as one key factor. We have named this part "Age management". Age management comprises 4 dimensions:

(i) attitude towards own aging,
(ii) support for work together,
(iii) organisation of work, and
(iv) communication with older workers.

Stereotyping ones own aging leads to stereotyping the aging of colleagues and employees, too. Because there is no relevant reasons for stereotyping aging a realistic attitude which takes into account both the strength and weaknesses should be adopted (Ilmarinen 1997). Identifying the signs of mental growth during aging in ourselves we can understand that it happens in other people as well. Supervisors can support ways of working together. A high level of hierarchy at work leads to low work ability of the employees - and the opposite: the more team work -the better work ability of the employees. The participation of supervisors in team work is a strong sign of their appreciation for this type of co-working. Active participation of supervisors is appreciated specially by the older employees. The most demanding skill in age management is the organisation of work by taking into account the changes in employees' capacities and wishes. Changing strengths with age means, e.g., both mental growth and lower health status. In principle, the work should change according to the strengths of the employees. Therefore, more individual solutions are needed. To put it very strongly, a good supervisor will always find individual solutions while a poor supervisor never looks for individual adjustments. The fourth skill needed is the communication with employees. The older workers appreciate open-minded communication and early information about coming changes. Their acceptance for changes can be improved by talking with the experienced employees and asking for their opinions about the matter. The adoption of age management is probably the most important single topic in the whole concept of work ability promotion. Another important topic of adjustments is the flexible working time schedules. According to Knauth (1998) there are more than 10 schedules available where either flexibility for the worker or for the company can be taken into account. Schedules of "time-autonomous working groups", "variable working time", "time windows" "flexitime" and "teleworking" offers good possibilities to increase the flexibility for the workers.

The fourth corner of the pyramid focuses on updating the professional competences. A clear reason for updating knowledge and skills is that new work demands are directed to everyone, independent of the age of the employees. Because older workers are distributed rather evenly in several occupations, they meet at work the same new expectations as the younger workers. However, the basic education level is very different between the younger and older workers. While the majority of the younger workers has the higher secondary education as the level of basic education, about 40% of 45-54 years old and about 55% of 55-64 years old workers have only primary education as their school education (Fig. 11). Therefore, many of the work ability demands of the information society, like computer skills and languagues, are much more difficult challenges for the older than younger employees. New technology and computer skills are also one important field where the lack of competence can easily set large numbers of older employees aside from working life. The results of information technologists showed that e.g. difficulties in understanding terms and finding information from user manuals are notably increased with age. When only 10% of employees under 30 years of age didn't understand the computer terms, about 50% had similar difficulties in the age group 56+ (Seppälä, 1995). Therefore, life long learning and appropriate training methods are urgently needed for older workers. For more information about the learning of older workers I would like to refer to the article of Warr in this issue.

Experiences of the promotion concept

Our experiences of the pyramid-concept for promoting the work ability indicate that the decline of work ability with age can be stopped, improved, when poor or moderate, or maintained, when good or excellent. As one example the changes of work ability index of individual female office workers are illustrated in figure 12. The first part of the individual curves show a decline of work ability index during 4 years (from1981 to 1985). During the next 6 years (from 1985 to 1992) the individual curves have taken a turn to the better through the appropriate actions explained earlier in table.

The pyramid concept emphasizes that improvements in work ability affect productivity of work and quality of life of the workers. The economic analysis of work ability promotion in a metal company (829 employees) indicated that the investment of FIM 0.3 million/year for the actions produced an output of FIM 3.0 million/year during 3 year project. The company derived profit from lower work disability costs (FIM -1.6 million/year), higher total productivity (FIM +1.3 million/year), and lower sickness absences (FIM -0.2 million/year).

Another example of municipal workers indicated that an improvement of work ability was associated with life satisfaction (Figure 13). While the proportion of those employees who were very satisfied with their life situation did not differ according to the work ability level in 1981 (13-16% in women, 10-14% in men), the situation changed during the follow-up. The proportion of women (22%) and men (16%) being very satisfied with life was increased (significantly among the men) in 11 years if the work ability was good or moderate, whereas life satisfaction tended to decrease among those men and women, whose work ability was poor in 1992 (see figure 13).

The pyramid concept also covers the period of the "Third Age", which is the time after retirement. Our hypothesis is that the Third Age is dependent on the Working Age period. Our preliminary findings of the 11 year follow-up is supporting the hypothesis. The 16-year follow-up data of the original cohort is collected in 1997, when their age range was 61-74 years. This data enables us to better study the effects of late Working Age on early Third Age.

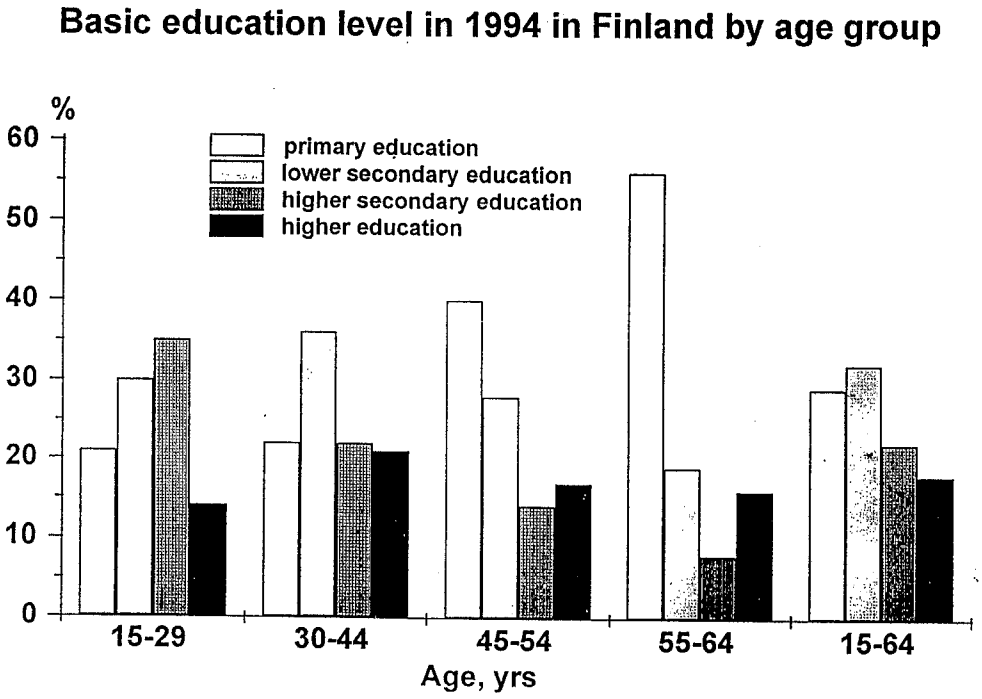

Figure 11. Basic education level in 1994 in Finland by age group.

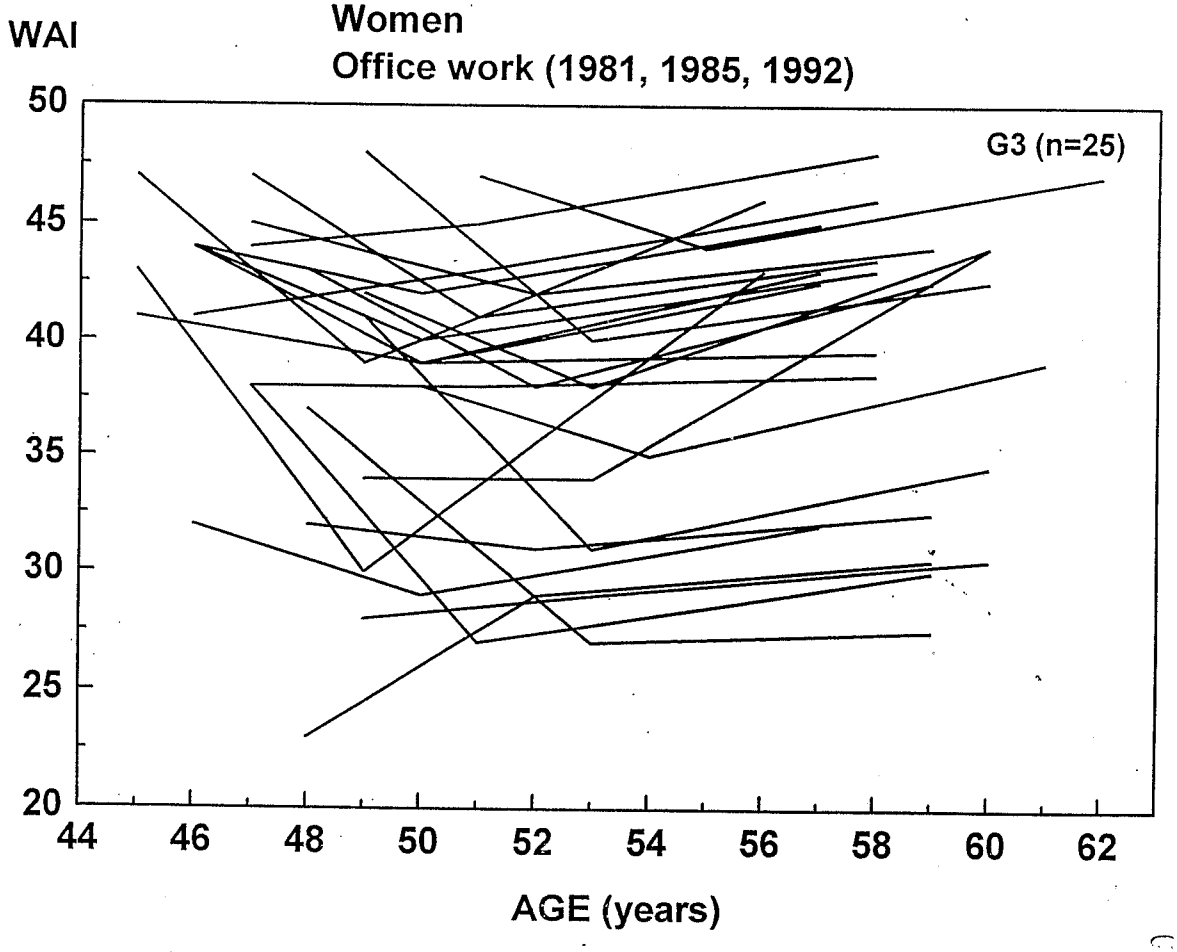

Figure 12. Changes of individual work ability scores of female office workers (see text).

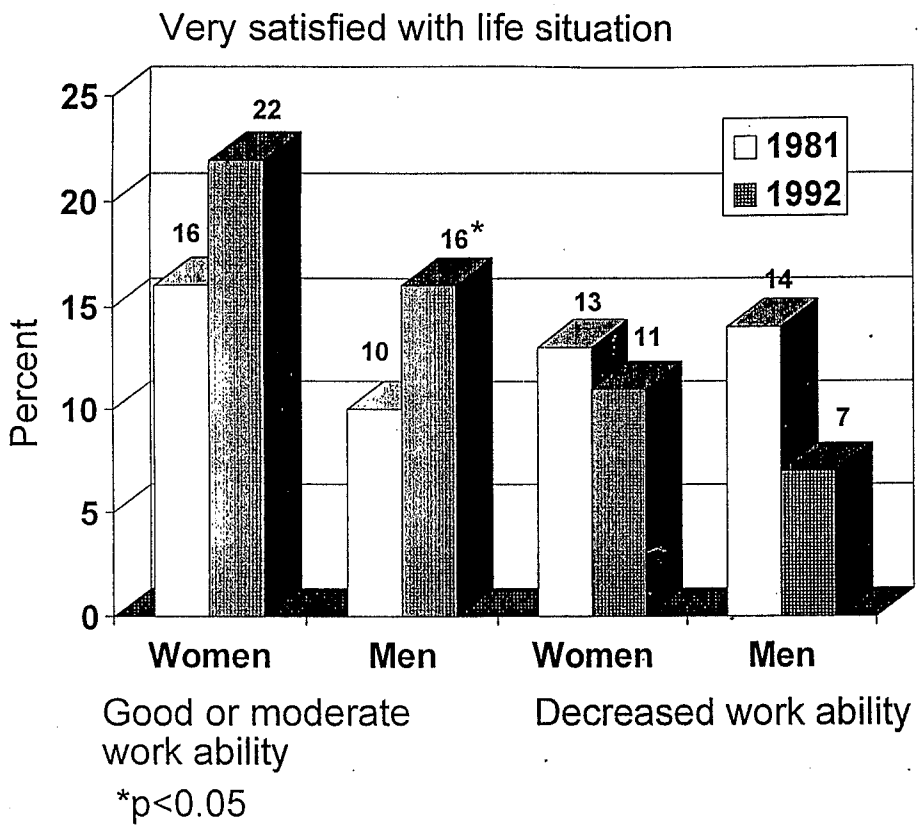

Figure 13. Relationship between work ability and satisfaction with life situation.

References

1. CDC. Physical Activity and Health. A report of the Surgeon General. Atlanta; GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.
2. Ilmarinen J. The Aging Worker. *Scand J Work Environ Health* 1991;17(1):1-141.
3. Ilmarinen J. Aging and work - coping with strengths and weaknesses. Editorial. *Scand J Work Environ Health* 1997; 23:3-5.
4. Ilmarinen J, Tuomi K, Klockars M. Changes in the work ability of active employees over an 11-year period. *Scand J Work Environ Health* 1997; 23(1):45-57.
5. Knauth P. Designing better shift system. *Applied Ergonomics* 1996;27(1):39-44.
6. Seppälä P. Experiences of computerization in different occupational groups. *Int J of Human-Computer interaction* 1995;7(4):315-327.
7. Shephard R.J. Aging and productivity. In Ilmarinen J. (ed.) *Aging and Work*. International Scientific Symposium on Aging and Work, 28-30. Mai, Haikko, Finland. Proceedings 4, Institute of Occupational Health, Helsinki 1993,11-24.
8. Spirduso W.W. Job performance of the older worker. In Spirduso W.W. (ed.) *Physical dimensions of aging*. Chapter 13. Human Kinetics, Champaign, ILL, 1995, 367-387.
9. Tuomi K, Ilmarinen J, Eskelinen L, Järvinen E, Toikkanen J, Klockars M. Prevalence and incidence rates of diseases and work ability in different work categories of municipal oocupations. *Scand J Work Environ Health* 1991;17(1):67-74.
10. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. *Work ability Index*. Occupational Health Care 19. Institute of Occupational Health, Helsinki, 1994.
11. Tuomi K, Ilmarinen J, Seitsamo J, Huuhtanen P, Martikainen R, Nygård C-H, Klockars M. Summary of the Finnish research projects (1981-1992) to promote the health and work ability of aging workers. *Scand J Work Environ Health* 1997;23(1):66-71.
12. Tuomi K. Eleven year follow-up of aging workers. *Scand J Work Environ Health* 1997;23(1):71.

3.2 Successful ageing in physically demanding work: preventive measures in all age groups required.

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As in the total working population, an increase in the mean age of the work force is also expected in many sectors of industry characterised by physically demanding work. With this prospect in mind, an increase in morbidity rates of musculoskeletal disorders and related disability is not unthinkable. In order to clarify the impact of the ageing of the workforce on these figures, cross-sectional and longitudinal epidemiological studies were carried out by our research group based on data from around 70,000 questionnaires on work and health. Main research question was: is there a relationship between age, physical work demands, and musculoskeletal complaints?

The cross-sectional analyses revealed increasing prevalences of musculoskeletal complaints with advancing age for both sexes and all categories of work demands up till the age group 45-54 years, often followed by a sharp decline in the oldest age group. For several complaints, substantially higher rates were reported for women than for men.

In the follow up analyses, the development of prevalence rates of musculoskeletal complaints over four years was studied for workers in heavy physical work (exposed) and mental work (reference) in four age groups. For most complaints, higher increases in prevalences over the follow up period were found in the exposed group when compared with the reference group, particularly within the group aged 40-49 years for complaints of the back, neck, and several sites of the upper and lower extremities. However also within the age group 20-29 years significantly higher changes were already reported for complaints of the low back, neck, shoulder, upper and lower leg, and knee. Within the oldest age group (50-59 years), an effect of exposure to heavy physical work demands was only reported for neck and upper arm complaints. Additionally, for complaints of the back, neck, upper and lower extremities within the cohort free of complaints at the start of the follow up, highest prevalences after four years were also reported in the exposed group aged 40-49 years. However, also here, high prevalences of ‘new’ complaints could already be observed in the youngest age group in heavy physical work. Based on these results it can be hypothesized that especially for the age group 40-49 years, the many years of exposure to harmful work demands in combination with the changed balance between physical workload and physical work capacity result in a high risk for developing musculoskeletal complaints. However, also in the youngest age groups this risk is already present. The vague association between physical work demands and musculoskeletal complaints in the oldest age group presumably can be attributed to the effects of health-related turnover of employees, generally masking the occupational health risks in epidemiological studies.

Judging on these results it can be concluded that policy measures directed only to the ‘survivor’ population of elderly employees in physically demanding occupations does not seem to be adequate and effective on the long term, as many of the problems already seem to find their onset at younger age. Measures introduced for the benefit of all age groups, including the younger ones, may have positive effects on health status and functioning of current as well as future generations of elderly employees in physical work. Such a policy, which tends to deal with the varying situations and needs of employees of different ages, is often referred to as an age-conscious social policy. The primary goal of policy measures for the aging employee in physically demanding work should be to counteract the change in

balance between the physical workload and physical work capacity with advancing age in order to prevent the onset of work-related disorders during the career. Finally, four main strategies for this purpose can be proposed:

1. career planning and development,
2. ergonomic interventions,
3. shortening of exposure time to physically demanding tasks,
4. promotion of physical exercise.

3.3 Aging, work related musculoskeletal disorders and work activity. An example in an aircraft construction company.

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A study on the age of assembly operators, the condition of their joints and their work activity was undertaken in an aircraft construction company on the request of its management. The underlying concern was to set up a preventive policy in connection with the aging of labor.

At the beginning of the study, because of the low rate of hiring and the number of early retirements, there were few workers aged 25 or under, few workers aged 49 or over, the 41-46 age group being predominant in the company. By year 2000, nearly 60% of the operators will be over 40 years old.

Most parts are assembled by hand-riveting. Assembly and preceding operations involve remaining, often for a long time, in strenueous postures. The combination of both conditions (strenuous postures and exposure to impacts and vibrations) is known to have a negative bearing on joints which adds on to aging effects.

Musculoskeletal disorders are found in 71% of blue-collar workers. Lumbar disorders are largely predominant and reach high proportions in those over 40. As for the lower limbs, knee problems prevail to a large extent. In the case of the upper limbs, results show that the "usual arm" is much more affected than the other one, regardless of the joint considered (shoulder, elbow, or wrist). The degree of joint and rachis disorders is similar to that noted in the ESTEV survey for construction workers. The blue-collar workers who show only one type of joint disorders represent 29% of the total population, whereas 42% suffer from at least two types of joint disorders. Such disorders increase with age but their progression grows slower in the group over 50. This moderate and contrasted progression is not in line with the results generally observed.

Assembly operators are organized in teams of 4 to 10 people. Each one is capable of performing most of the tasks entrusted to the team. However an analysis of the activity shows the work is distributed in such a way that the older ones are less exposed to strenuous tasks and time constraints that are therefore left for the younger operators. Conversely, the more subtle tasks requiring either experience or specific know-how are generally performed by the older ones. Tasks involving exposure to straining postures, shocks, vibrations are more often fulfilled by operators in the 30 to 39 age group.

This type of work distribution amounts to a form of protection for the older operators. It may even account for a lesser degree of joint disorders in that population. Another advantage it offers is that aging operators are not assigned to isolated jobs or underrated. They can stay on the teams since their work allows them enough freedom of action to compensate for their shortcomings. On the other hand the 30-39 age group undergoes the greatest part of the work-related constraints with their likely consequences on this population's health. This organization is also threatened because of the aging of labor and the decreasing number of young people hired. The company now takes action in several directions:

- by hiring young people who can carry out the most physically demanding work,
- by adjusting the existing workstations, in particular their spatial layout, to allow the older ones to fill in more jobs while contributing to improve the condition of the younger ones,
- by changing the assembly procedures.

3.4 Changes in work in relation to Finnish managers' work ability.

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The present study investigated the work ability and its structure in a sample of Finnish engineers and technical employees working in management positions (ranging from shop floor supervisors to senior managers). In addition, the relationship between changes in work (e.g., downsizings, lay-offs, unemployment experiences, increased work load) and managers' work ability were studied. The questionnaire data was gathered in spring 1996, at a time when Finnish organizations were undergoing upheaval changes due mainly to the deep economic recession which started in the early 1990s. The postal questionnaire data were gathered from 1035 managers from different fields of industry. The mean age of the respondents was 44 years (range 25–65 years). The majority of them were male (92%). The managers' work ability was investigated by using the work ability index (WAI) developed by the Institute of Occupational Health, Finland. The WAI is widely used instrument in occupational health care in Finland and, to date, it is translated into at least 12 languages. The results revealed that the managers' overall work ability decreased significantly after the years 55+ which is in accordance with several other investigated Finnish occupational groups. In addition, the average sick leave during the past year (12 months) was the highest in the age group of 55–59 as well as the number of current diseases diagnosed by a physician. This age group also showed the lowest current work ability compared with the lifetime best, and the lowest work ability in relation to the mental demands of the job and mental resources. Regarding to work changes, 15% of the all participated managers had unemployment experiences and 17% lay-offs experiences during the past five years (1992–1996). In addition, 63% of the subjects reported that their time pressures and mental strain had increased remarkably in that time. Positive development had taken place concerning the physical safety at work (decrease of some adverse factors in work environment). The responsibility, autonomy and influence at work were remarkably increased. Psychosomatic symptoms were increased indicating higher stress reactions. The high amount of psychosomatic symptoms correlated with the low WAI score (0.56), and with the weak sense of coherence. Work ability and other resources of managers do have important effects on the organizational climate and productivity.

3.5 Perceived job demands and work ability of ageing municipal white and blue collar workers in 1981 and 1996.

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Job demands and work ability of ageing (45+) municipal workers have been followed regularly with questionnaire surveys since 1981 by the Finnish Institute of Occupational Health (FIOH). In 1996, a Technical Department of the City of Kuopio (TDCK) completed a questionnaire survey for enhancing actions for promoting work ability and well-being of workers. The questionnaire included 10 items which were identical with the FIOH questionnaire. Six of them belonged to the Work ability index.

The aim of the present study was to compare perceived job demands and work ability in 1981 and 1996 with samples of workers being matched according to area location (Eastern Finland), job demands (white and blue collar jobs), gender (men), and age (45+). The white collar workers consisted of managers and foremen and the blue collar workers skilled and unskilled workers. After the matching the number of respondents in 1981 was 50 among the white collar workers (age 51±3 years) and 214 among the blue collar workers (age: 51±4 years). In 1996, the number of white collar and blue collar respondents was 43 and 54, respectively. The age was 50±4 years in both samples.

In 1996, over three thirds (79%) of the white collar and 54% of blue collar respondents felt that job demands in generally have increased during past two years. In 1981, the corresponding values were 48 and 24%, respectively ($p<0.0l$). Also mental job demands were perceived too high more frequently by the white collars respondents in 1996 (53%) than in 1981 (29%) ($p<0.05$). The number of those who felt to have too high physical job demands was about equal among white and blue collar respondents in 1981 and 1996 (4 and 42% vs. 3 and 32%. respectively). Both in 1996 and 1981 about one third of the white collar respondents perceived to have excellent work ability (29 and 37%, respectively). For the blue collar respondents these proportions were smaller (13 and 26%, respectively). In 1996, the work capacity was considered poor with the respect of physical job demands by a few white (2%) and blue (7%) collar respondents. In 1981, the corresponding proportions were larger (10 and 19%, respectively) ($p<0.00]$). There were observed no significant differences in psychological resources in 1981 and 1996. Most of the present white and blue collar respondents predicted that they will be able to work in their current jobs after two years (86 and 65%, respectively). In 1981, these proportions were smaller ($p<0.001$) being 70 and 29%, respectively.

The results suggest that general and mental job demands in particular are presently higher among white collar workers than those in 1981. However, the differences in work ability and psychological resources were small between the results obtained in 1981 and 1996, and current workers seemed to have a more positive view regarding their future work ability than those in 1981. The observed differences were systematically more positive among blue than white collar workers. The results obtained in 1996 have affected by a strong selection of respondents because the number of workers in the TDCK has decreased by 28% since 1990, and the current workers can be classified as survivors. The TDCK has also carried out several ergonomic and physical exercise programs for promoting the work ability of workers during past 10 years. Each ageing worker has participated in a some kind of action for promoting his or her work ability.

3.6 Promotion of the Danish employees' work ability.

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Background: In Denmark the official "pension age" is 67, but the actual age of retirement is 61. Especially women and persons with physically hard work leave the labour market early. Furthermore, the working population older than 50 years of age will grow during the next 15 years. Therefore it is a necessary to maintain and promote the work ability of the elderly employees. Already existing models on this issue are the Finnish concept of work ability (WAI), the concept of Work Place Health Promotion (WPHP, the Luxembourg Declaration), and finally the Work Place Assessment (WPA).

The purposes of the study are:

- general population level:
- to establish a reference group based on an existing cohort of 6000 employees
- to identify risk groups in this cohort
- at company level:
- to develop a suitable model for promotion of work ability at Danish work places (based on WPA, WPHP, WAI)

This paper focuses on the feasibility study at company level being conducted at present. We expect the companies to co-operate actively and to take a responsibility. We have introduced the concept of work ability to the companies. Furthermore, we have introduced the problem solving cycle from the WPHP. Finally, the companies are asked to carry out the compulsory WPA and incorporate the other two concepts.

We have planned to conduct the study during a 1-year-period. At baseline the companies will identify the problems, make plans for solution of the problems, and designate the persons responsible for this. After half a year and one year the companies will make a follow-up of their WPA-programme. At the same time an observation study will be conducted by the NIOH. This study will include an assessment of the work ability based on the Finnish questionnaire and a clinical examination followed by a consultation. The baseline period of the observation study will be fixed to that of the intervention study (WPA at work places). Thereby we will obtain measures for the changes at work place level and the effect thereof on the work ability.

The cohort consists of 600 persons aged 18-67, and they are divided into the following three groups: physically hard work, mixed physical and mental work, and mentally demanding work.

The feasibility study began a month ago. Until now I have experienced both positive and negative attitudes towards the project. Both the employees and the employers are very interested. They want all age groups to participate. Their arguments are that solving the problems will affect all age groups and preventive measures must be introduced early. They have accepted the broad concept of Work Place Assessment, they cooperate actively, and they take a responsibility for their part of the project.

But the following problems have been emphasised. They are afraid of the focus on the individual. This attitude is partly based on the Danish tradition for handling problems at the work places. There is a missing link between the health care system and the work places. In Denmark we have three almost totally separated institutions; the health care sector, the social sector, and the work places.

Traditionally we have the Occupational Health Service Centre as consultants at the work places. Their goal is to act as consultants at group level, and the topics are both technical problems and health problems. However, this system is not available at all work places. Finally there is no tradition for co-operation between the work places and the Occupation Health Centres at individual level. We have to create comprehensive models for transferring information regarding personal issues, e.g. health and work ability, to the companies.

During the last years new legislation has been introduced to help keeping employees work-active, but the implementation is not fulfilled. This means that we have to find the ethical, the political, and the practical barriers before we can implement the concept at Danish work places.

4. General conclusions and recommendations

Reflecting the demographic changes, the working populations in Europe are ageing. Many employers and state agencies fear that this will imply loss of productivity and increased costs for early retirements and health care. So far, these fears have been addressed by a tendency to cut retirement benefits and health care, which may lead to disadvantages in terms of health and resources available to individuals in the ageing population. At the same time, employers tend to employ fewer ageing workers and often lay them off when down-sizing and slimming organizations. On the other hand, the employment of ageing persons has several potential advantages:

- Ageing employees have been demonstrated to be as productive, in general, as younger ones. In many settings they are even more effective. Studies from Finland demonstrate that the cost-benefit of introducing training programs for promoting work ability of ageing employees is favourable.

- Ageing employees contribute to the continuity and the survival of an organisation. They are bearers of knowledge and of corporate culture, and they often have skills and experiences that go beyond their particular job tasks. These qualities of ageing employees cannot be captured by traditional profit figures, and therefore new definitions of success and usefulness need to be developed.

In order to support and improve the employability, effectiveness and work ability of the ageing workforce, the following recommendations can be made to companies and state agencies. Three areas are covered; employment and retirement policies, learning and competence development, and work ability and health.

Conclusions and recommendations on employment and retirement strategies.

- The negative social and human-resource consequences of laying off ageing employees in Europe are immense. The issues of maintaining, supporting and improving the employability and work ability of ageing individuals must be brought back on the European agenda. Actions are needed on the individual company, national and European levels.

- European activities should place special emphasis on the development and distribution of accurate information on the capacity and skill of older workers.

- The negative expectations on the ageing workforce must be counteracted by targeted information. It is acknowledged that in particular the attitudes of employers are crucial for employment of the ageing workforce. Succesful case studies exist demonstrating positive effects of company policies that enable ageing individuals to remain at productive work. Practices that focus particular attention on the following areas have been identified as crucial for success:
  - recruitment
  - training, development and promotion
  - flexibility in work practices (work organisation)
  - improvements in ergonomics
  - correct attitudes about the factors of aging within organizations

  - non-discriminatory exit policies
- The following forces were identified as relevant to promoting development of good practices:
  - economic and labour market (e.g. shortages)
  - changes in public policy (e.g. retirement or pension policies)
  - organisational culture (e.g. human resource traditions)

- Crucial factors for success in settings where older workers were recruited or retained are:
  - backing from senior management
  - a supportive human resource environment
  - commitment from ageing workers
  - careful and flexible implementation of changes

- The importance of support from unions was emphasized. Despite their wish to help individual workers who (usually for health reasons) need early retirement under reasonable terms, they should be engaged in this issue on the grounds of their overall goals. These are presumed to focus on just policies, with an emphasis on prevention of early exits from work life through good work design.

- The importance of flexible solutions, especially with regard to working hours, was highlighted as a method to remain in working life. A number of surveys have reported that ageing workers usually do not object to slight reductions in wages, as long as their employment and social security is maintained. Organisational changes encompassing working hours, training and changed job demands can usually be implemented as long as security of employment is guaranteed.

- It was also concluded that national and company policies with regard to work organisation and retirement must be reasonably stable over time. Repeated policy changes reduces the confidence of employees.

Needs for research on employment and retirement strategies:

- More company case studies are needed, to demonstrate successful as well as unsuccessful policies. Companies need support of researchers when implementing and evaluating new policies.

- European activities should include performing large scale inter-national comparisons of national policies and their consequences. The excellent work, already ongoing, comparing different states with regard to retirement and employment policies and their consequences for the ageing workforce, should be pursued. Integrated European research must be encouraged.

- There is a need for research which integrates knowledge about the capacities of the ageing individuals, the demands of tomorrow´s work places, and the policies suggested by nations and companies.

- Further research on the design and consequences of different flexible work organization schemes, especially flexible and part time work, should be supported.

Conclusions and recommendations on learning and competence development of the ageing workforce.

- Older employees must develop new skills and knowledge in a changing world; continued learning is essential.

- Research has shown that ageing persons can learn and develop their competence throughout their working lives.

- Learning can enable individuals to perform a work task in a different and possibly more creative way. This has a positive effect both on the motivation of the trainee and on the employer´s motivation to embark on training programs.

- A large number of factors exert a strong influence on learning ability, and age as such is a poor predictor of learning abilities because of large inter-individual differences. Attending to recommendations given here will benefit learning for individuals of all age groups.

- A positive ´learning climate´ at the workplace should be promoted by management:
  - Negative expectations about the learning ability of ageing individuals may be attributed to their lack of practice, since they take part in less training than young persons. Disuse of one´s learning ability may thus cause a decline, but this is reversible.
  - Older workers are frequently excluded from or not provided information about new learning or training opportunities.
  - More efforts should be spent on motivating ageing individuals to learn new skills. Rewards like public recognition, concrete benefits, encouragement from older role models, possibilities of promotion and/or transfers will help. Feedback about progress is necessary.

- The context of the learning situation may have to be adapted:
  - Ageing individuals may need more time, and high-paced learning should be avoided.
  - Individuals with special problems should be identified and supported, e.g. by pretraining of literacy, numeracy and symbols and terms necessary for the subsequent training.
  - Physical impairments and ill health must be considered when designing a training programme.

- Training should be organized to help older individuals to ´learn how to learn´, e.g. learning which strategies to use, and learning how to monitor oneself or acquire assistance from fellow-trainees:
  - In some cases it may be best to provide training to all age groups together, provided it can be organized without time constraints. In other cases mixed groups may be less advantageous; it appears however to be better to compose training groups based on criteria other than age.
  - Training must build on older individuals´ expertise, e.g. through building on familiar examples and previous knowledge and experience.
  - The load on working memory should be reduced by e.g. lists, handouts and other types of support.
  - Where feasible, older individuals should be used as trainers.

Needs for research on learning and competence development:

- Most research has investigated cognitive features of information-processing ability and relevant expertise. However, job performance is also determined by non-cognitive aspects of personality, motivation and interests. Some age-differences have been found in particular traits of personality, and differences in motivation and specific interests appear extremely likely. Deeper understanding of age and job performance requires a shift of research attention to consider also these non-cognitive features.

- Research is also needed concerning the development and application of learning and new knowledge in the workplace. Learning takes place both in courses and at the workplace, and the interaction between the individual employees, the group, and the work task is a dynamic process which encompasses learning and the development of new strategies. These strategies may enable individuals to perform better and develop through work.

Conclusions and recommendations on work ability and health of the ageing workforce

- Using the Work Ability Index (WAI) it has been shown that work ability declines with increasing age, and that this decline is most pronounced in physically demanding jobs. Individuals with a low WAI at ages around 50 run a higher risk of needing a disability pension after 10 years. Factors that appear to promote a decline in work ability at follow-up include:
  - increased standing in one place
  - decreased satisfaction with workrooms
  - decreased possibility for recognition and esteem at work
  - decreased vigorous physical exercise

- Decreased health and functional capacity, especially musculoskeletal disorders, are the main reasons for early exits.

- Adjustments in physical and psychosocial work environments are fundamental to maintaining and improving work ability. Ergonomic improvements include decreased repetition, better workstations and tools, improved postures and less standing at work. Psychosocial improvements include a change of attitudes to ageing, more team work, individual work organization solutions, and a new management style, ´age management´.

- Professional competence and life-style factors are other key issues to maintain work ability.

- Maintaining a good health has substantial effects on quality of work and quality of life. Occupational health services have an important role to maintain health and advice on work practices for ageing workers.

- In a Finnish case study from the metal industry, a ten-fold return on investment in health promotion was demonstrated.

- Actions to improve work ability must be started early, as part of career planning. Investing only in those aged 50-55 who ´survived´ at work will not protect younger persons who are already at risk of developing chronic problems. Thus actions to improve work design will benefit all employees, not only the oldest age groups.

Needs of research on work ability and health

- More research is needed to identify work tasks and work organisations that accelerate the negative aspects of ageing. Large inter-individual differences between ageing workers can be observed, and this is thought, at least in part, to be consequences of different working life careers. Better understanding of the work-related causes of these differences will be important for successful interventions that promote health and individual development during ageing.

- Research is needed to identify optimal work organisations for ageing workers. This includes questions of working hours, distribution of breaks, time for recovery and team structures that best use the skills and capacitities of the mix of younger and older workers.

- The aged individual´s way of coping with work demands needs more study. Why do some individuals manage and others fail?

- It is proposed that aspects of ´ageing´ of the workforce should be included as a fundamental component of most work-life research. Even though ageing and work ability may not be the primary focus of a work reorganisation, the consequences should be analyzed using an age perspective.

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The National Institute for Working Life is Sweden's center for research and development on labour market, working life and work environment. Diffusion of information, training and teaching, local development and international collaboration are other important issues for the Institute.

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