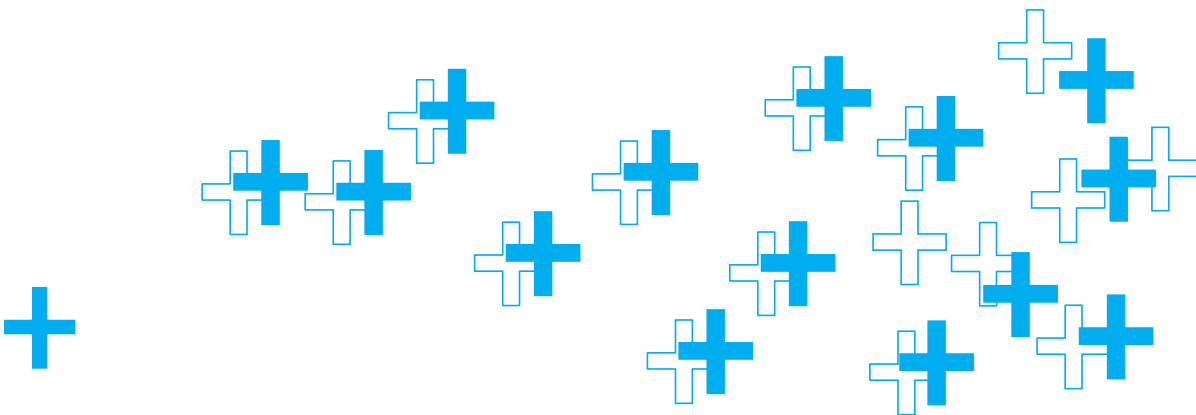# WORK WELL

INCLUSIVE FURNITURE FOR OLDER OFFICE WORKERS

Jeremy Gay

WORK WELL:
INCLUSIVE FURNITURE FOR
OLDER OFFICE WORKERS

New areas of opportunity in the design of
workplace solutions for people over 50

Jeremy Gay

Contents

Research Partners

The research documented in this publication is the result of collaboration between the Helen Hamlyn Research Centre and Kinnarps Office Furniture.

The Helen Hamlyn Research Centre was set up at the Royal College of Art in January 1999 to alert design and business communities to the far-reaching implications of a rapidly changing and ageing society. It works to advance a socially inclusive approach to design through practical research projects with industry. Its Research Associates programme teams RCA graduates with industry partners. The research centre has an ongoing programme entitled Office Age, which is demonstrating that older workers have different needs - physical and emotional - from those just entering the workforce. Office Age focuses on issues such as: new ways of working, accommodating diversity, recognising experience, pro-active healthcare and improving quality of life in the workplace.

www.hhrc.rca.ac.uk
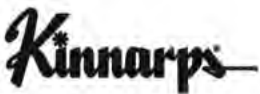
Kinnarps is Europe's third largest office furniture manufacturer. It was founded in Sweden more than 60 years ago and is now located in over 30 countries. Its Swedish origins have helped develop a culture where ergonomics, quality and a deep-felt care for the environment are a natural part of everyday life. This culture is combined with a wide product portfolio and broad experience in helping clients manage change. Above all, Kinnarps' focus is on people and creating environments that inspire, motivate and care for their well-being.

Jeremy Gay studied Architecture at Edinburgh University and Interaction Design at the Royal College of Art. He graduated with an MA (RCA) in 2002, receiving a distinction in cultural studies. He has worked with leading design practices in London, Sydney and Edinburgh including Pentagram, Edward Cullinan Architects, Hawkins Brown, Tonkin Liu, Feilden Clegg Bradley Architects and Conran Associates.

Jeremy founded Felde Design in 2003 and is part of the Arcola Collective, a multi-disciplinary group specialising in user-centred design. Projects include: concept development for the future of in-flight experience, the Selfridges Christmas lights, the design of the Royal College of Art student canteen; and the Gaia sustainable technology demonstration centre.

www.felde.org

Executive Summary

The Work Well project began with the question: how can work furniture be better designed to meet the needs of older users?

The study was set in the context of a demographic shift to an older workforce in Europe. This change has highlighted the need for businesses to proactively respond to the issues faced by older workers in the workplace. It has also highlighted a need for a more inclusive approach to workspace design.

Older workers are often experienced and valued employees, but few office furniture designs exist that specifically address their needs. What precedents there are, tend to be related to care furniture, which can have a stigmatising effect for users, particularly in environments with a wide range of ages.

The people who buy or design work furniture are not necessarily those who end up using it. This fact highlights a disconnection with the end user.

Kinnarps has a long history of listening to those who use its furniture, as well its specifying clients, acknowledging that they are not necessarily one and the same. This research follows a user-centred approach that continues this tradition of listening.

Aims

- To understand older workers' needs in relation to the workspace and their working experience, including the broader factors that affect the ability and desire to continue working.

- To find and illustrate areas of opportunity in the design of work furniture for older users.
- To develop inclusive new concepts as exemplars that address the specific needs and desires of an ageing workforce while providing better solutions for everyone.

Methods

This research documents how an understanding of older workers was built through desk research and by soliciting direct user feedback through online questionnaires, in-depth interviews, workplace 'probes' and site visits.

Findings

The research was translated into a series of observations and resulted in nine key findings. These helped to understand the workplace from the older workers' perspective. The findings presented a series of design challenges that warranted a response in the form of new exemplar designs.

The findings fell into three categories: Desk Work, Mobile Working and Proactive Healthcare. The first related to usability problems and lack of control at the workstation; the second communicated findings related to older workers becoming increasingly mobile but encountering difficulties in working in new places; and the third discussed findings related to the need for health, well being and personal development in the workplace.

Outcomes

The outcomes of this project are nine new design proposals for work furniture that illustrate and demonstrate an inclusive approach to work furniture design. They establish a way of thinking about inclusive design for older workers and suggest new opportunities for product development.

- **Castro:** A meeting table with innovative cable management, wheel locking, integrated lighting and height adjustability.
- **Aqua:** A movable screen with high performance sound-absorbing panels that are lightweight, translucent and adaptable to receive accessories at any height.
- **Stretch:** A series of stacking chairs that visually prompt more active working habits.
- **Nemes:** A furniture solution for user customisation in hot-desking situations.
- **Hemet:** A stand-alone concept for working in public spaces providing a comfortable and compact working solution for older workers working away from the office.
- **Motoro:** A micro workstation to ease the strain of working in motion.
- **Presence:** A device for use with any task chair, providing proactive healthcare at work through simple user-sensing abilities.
- **Asas:** A circular, modular seating system for adding amenity to space-restricted workplaces.
- **Plato:** A multi-functional concept for temporary learning and team-working that can be used as a presentation easel, lecture lectern, laptop holder or equipment trolley.

Benefits

The designs aimed to benefit individual users by basing solutions upon listening more closely to their problems. The designs also aimed to assist facilities managers and others interested in workspace organisation, by highlighting problems and increasing their knowledge of ways to provide environments for an ageing workforce. In the widest sense, the designs present benefits to society by attempting to accommodate the needs of a wide range of users and offering solutions to problems faced by people using work furniture on a daily basis and throughout their now extended working lives.

Introduction

The Workforce is Ageing

There is little doubt that the demographic shift towards an increasing number of older people at work will impact on how we plan and deliver successful workplaces in the future. There are several key factors that are influencing this change:

- By the year 2020, close to half of the adult population in Europe will be over 50.
- The current and future pensions shortfall will result in people working for longer.
- More people are working flexibly and in different, less-traditional locations.
- People are living longer and also staying healthier for longer.
- More people want to work longer out of choice.
- New age and disability discrimination legislation will affect the way we think about workplaces and how work furniture is procured.

Research Aim and Objectives

The main aim of this research project was to find and illustrate areas of opportunity in the design of work furniture for older users; to develop inclusive new concepts as exemplars that address the specific needs and desires of an ageing workforce while providing better solutions for everyone. The research followed a user-centred design process that utilises direct user feedback to analyse and iteratively develop design solutions that respond more closely to people's expressed and observed needs.
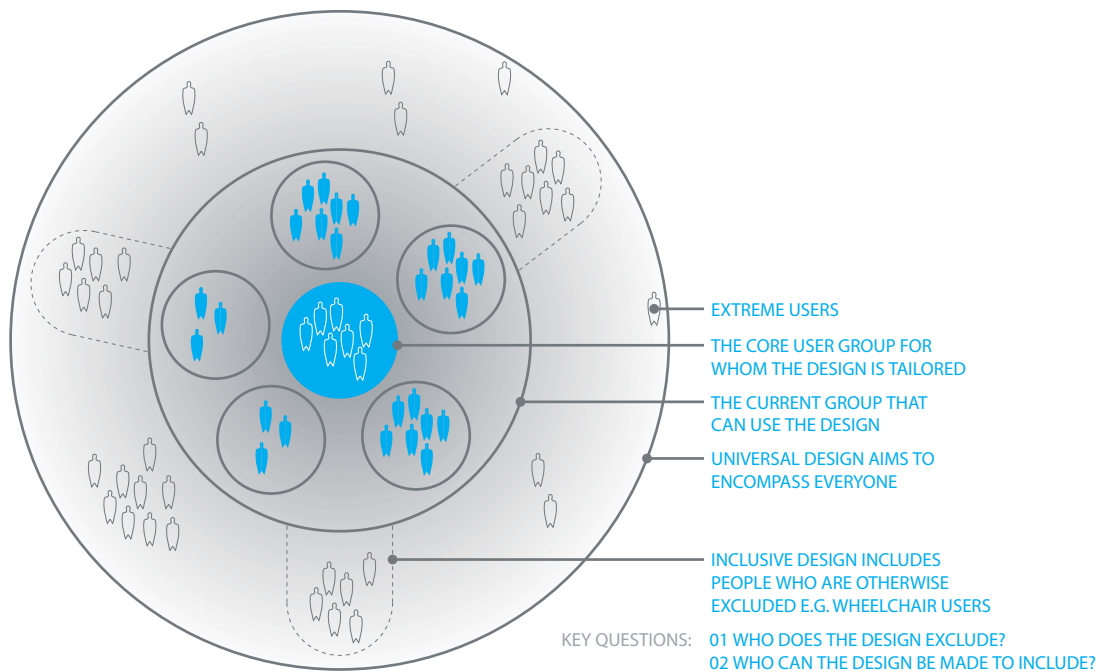
What is Furniture?

Conceptually, furniture is any structure that combines surfaces or containers raised at defined levels above the ground upon, or within which, objects are placed for a variety of functions and durations. The objects can be of varying sizes, weights and functional orientations, and include the body itself. Generally furniture responds to three basic behavioural needs: the desire for physical comfort, the convenience of rising objects to a comfortable height and the hoarding impulse, which creates the need to store. Furniture can also be thought of as a microcosm of architecture.

Designing Inclusively

Inclusive design is the design of mainstream products and/or services that are accessible to, and usable by, as many people as reasonably possible on a global basis, without the need for special adaptation or specialised design (which can be stigmatising). It is a process whereby designers ensure that their products and services address the needs of the widest possible audience, *including* users who would otherwise be excluded by a particular design.

Many people also use the term universal design (mainly in the United States and Japan). The intent of inclusive or universal design is to simplify life for everyone by making products, communications, and the built environment more usable for as many people as possible at little or no extra cost. This way of thinking about design aims to benefit people of all ages and abilities, treating older users as part

EXTREME USERS

THE CORE USER GROUP FOR WHOM THE DESIGN IS TAILORED

THE CURRENT GROUP THAT CAN USE THE DESIGN

UNIVERSAL DESIGN AIMS TO ENCOMPASS EVERYONE

INCLUSIVE DESIGN INCLUDES PEOPLE WHO ARE OTHERWISE EXCLUDED E.G. WHEELCHAIR USERS

KEY QUESTIONS: 01 WHO DOES THE DESIGN EXCLUDE?
02 WHO CAN THE DESIGN BE MADE TO INCLUDE?

of the mainstream. The terms inclusive design and universal design represent a goal rather than a fixed target. The main principles are as follows:

- Placing people at the heart of the design process.
- Acknowledging human diversity and difference.
- Offering choice where a single design solution cannot accommodate all users.
- Providing flexibility in use.
- Creating designs that are convenient, equitable and enjoyable to use by everyone, regardless of ability, age and gender.

About This Book

The first chapter explores the context of inclusively designed work furniture. It forms the what, where, who, how, why and when of the research.

It looks at the evolution of work furniture and the issues that influence contemporary designs, then at the changing nature of the workplace and how this drives thinking. It looks at the users themselves, in this case office workers over 50, focusing on

the issues that affect them, as distinct from other workers.

This is followed by a section focusing on changing work styles that picks through the new thinking, theories and strategies that influence how we work. Finally it looks at the statistical context, highlighting the significant demographic changes that created the impetus for this project.

The second chapter explains the different user research methods used during this investigation.

The third discusses the nine key findings arising from the research and the opportunities they present for product innovation.

The fourth chapter illustrates and explains nine exemplar furniture designs, which were developed in response to the findings. These designs are the main outcome of this research. They present possible solutions to problems and address the potential of the opportunities established in the preceding chapter.

1.1 What: Work Furniture

Work furniture is characterised by its specialised and technical solutions to the way we work. It forms the scenery of the workplace and it supports the workers and their work, literally and symbolically. Today's work furniture developed from traditional domestic forms like the bureau, writing table and height-adjustable stool. Over time solutions emerged and evolved that allowed the physical environment to accept change and be far less static.

Contemporary work furniture is more adaptable than domestic equivalents by its very nature, as evidenced by the modern task chair. This adjustability is inherently inclusive because it acknowledges that we all have different body sizes and posture preferences. But as this research will demonstrate, there is more to achieving good 'user fit' than just physical adjustments such as level, size and angle. Many issues influence the design of contemporary work furniture, some of which are discussed briefly below.

Functional Needs

Work furniture supports the core activities of the workplace and fulfils many functional needs such as storage, provision of power/data, display, and organisation. Thousands of products exist to respond to these requirements; they are categorised variously as: seating, freestanding, modular systems, screen-hung systems, storage systems, support furniture, specialised or ancillary furniture and workstations. Their materials need to be robust and easy to clean. Often designs focus on the harmonisation and coherent positioning of different elements, particularly in systems furniture. The essential question with all these solutions is one of usability and the ease with which the functions can be understood and accessed by users.

Environmental Control

Work furniture is used to create and control an individual's immediate environment. Variables such as lighting, temperature, ventilation, acoustic control, visual control and colour tend to be controlled centrally and collectively. This is because they are part of the architecture or building services. Furniture can help mitigate dysfunctional aspects of the wider workspace by being sensitive to an individual's requirements within the wider context. The control of environmental conditions is the foundation of a user's enjoyment and well-being.

Interaction

The psychosocial needs of workers vary just as physical ones do. In a world of change the act of meeting in teams is becoming critical to underpinning company culture. Space planning and furniture design is moving from focusing on efficiencies of space usage, which has become a 'given', to focusing on how interactions between its users can be more productive. Proximity and good lines of sight can help communication and stimulation, but can also be a cause of distraction. Work furniture can be used to create privacy for concentration and confidentiality, or

to enhance feelings of security, for example by being positioned to face someone approaching. Work furniture can also convey the image of the organisation or how valuable a particular activity is to it.

Sustainability

Sustainability is an issue of growing importance, not least in the workplace. New regulations such as the the Department of Trade and Industries' WEEE directive require greater energy efficiency and the proper disposal of office equipment, including furniture. Increasingly, clients, specifiers and users are demanding products that are made from sustainable sources or recycled materials. Products must be non-toxic in use, low in power consumption, easier to repair or re-use, and have installation methods that minimise environmental damage. Service providers are beginning to offer 'cradle to grave' leasing services on more elements of the office environment. Proactive environmental stewardship, which starts with recycling paper, is gradually extending to all aspects of the workplace. Some even suggest that the mental rigour of work can be used to promote better environmental habits and attitudes to consumption at home.

Technology

Work furniture design must respond to technological change. The workstation in particular acts as the focus for the use of information and communication technology and confluence of the physical and digital aspects of work. Today, smaller, lighter and more capable devices with better displays accompany the gradual disappearance of data cabling through wireless technology. Increasingly, any environment can be made into a workplace: 'wherever I am is where the workplace is'. Affordable and accessible network services are allowing more people to work effectively in remote locations and use high bandwidth services like 'voice over IP' and personal video conferencing. Soon, power cabling will reduce as well, with the introduction of induction charging areas on work surfaces.

Ergonomics

"When the point of contact between the product and the people becomes a point of friction then the designer has failed." Henry Dreyfuss, designer

Points of friction between furniture and its user can occur both physically and psychologically. Physical ergonomics relates to the way the body moves and to the positioning of furniture elements in use. Psychological ergonomics relates to our 'mental models' of things (for example a handle suggests pulling) and how a product engages with us emotionally. This is at least as important as how well a product performs mechanically, otherwise all our choices would be based strictly on price and functional performance, rather than on emotional resonance and visceral appeal.

Regulation through ergonomic standards has meant that desks and chairs must fit the worker to help minimise the occurrence of repetitive strain injury or cumulative trauma disorders (RSI, CTD). However, a large proportion of designs are based on idealised 'average' workers, whilst the variations in real
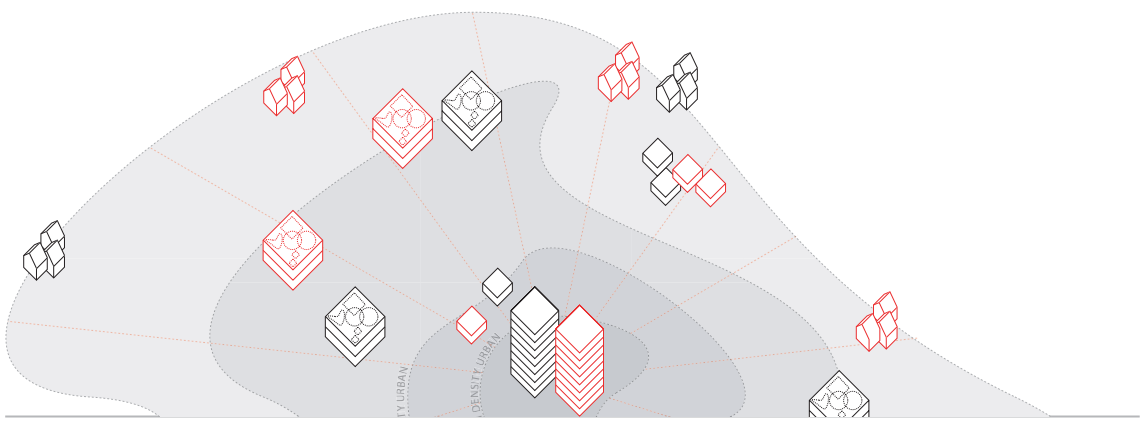
humans with different abilities and conditions are much wider. People who intensively use computers are the focus for ergonomic workstations more tailored to physical specifics of the user, but the increase in those using non-owned workspace is putting ease of adjustment at the forefront of concerns. Today, well-being in the workplace is an issue of public concern and is also being quoted as a management concern within corporate social responsibility. Avoiding workplace ailments needs considered management attitudes as well as the physical solutions that furniture provides.

Regulations and Standards

" If you can't measure it, you can't control it; but the easiest things to measure are the least important." Frank Duffy, DEGW.

Minimum standards protect the employee from poor conditions and bad practice and are an obvious target before considering the best and most preferable solutions for users. They ensure protection from injuries such as those caused by sharp corners, finger traps or electrical shock. The general direction of the standards is toward supporting cross performance through furniture (not just task chairs) that is multi-adjustable and suitable to individual employees. The focus is on easy-to-use features that allow spontaneous postural movements and support the flow of work.

1.2 Where: The Workplace

Office buildings are synonymous with work, but they have often proved slow to respond to new ways of working. Each generation of enterprise has had its own organisational and technological problems to solve and these problems have shaped the work furniture designed.

The 1960s saw a proliferation of International Style offices and the advent of modern systems furniture that allowed the physical environment to accept change.

In the 1970s designers focused on a democratic approach to the work environment. Status was not expressed in the physical vocabulary; individual and group control was accompanied by the varied expression of work settings.

In the 1980s the office space was perceived to support a working philosophy but not actually create it. The emphasis on employees went from an extracted degree of productivity to a fostered and supported contribution. The personal computer became widely accepted, necessitating a complex system of utilities, which had an impact on building infrastructures. Work furniture became much more architectural in its construction and ability to be modified. Universal systems of furniture were adopted which lessened even further the degree of diversity among work settings in line with the principle of " move people, not furniture". The principle was to create as much uniformity as possible, though there was some variation based on worker type.

In the 90s the concept of 'alternative officing' emerged that was a rethinking of how and where work gets done and what adds value. Technological

advances made time and geography more blurred, allowing work almost anywhere and at any time.

Today, workspaces are being used in new ways based less on hierarchy and more on activity or function; for example, private spaces are for those with a specific functional need for concentration or confidentiality in meetings, and not necessarily as a privilege of seniority. Mobile and distributed working discourages personalisation, so territorial claims have moved from the individual to the team space. Technology has given new meaning to workplace flexibility. Work is being separated from space and the reason for having offices or the form they should take is becoming less self-evident. More people have a multiplicity of places to work, many of which are outside the traditional office.

People have long used metaphors to understand and describe different types of workplace. The office has variously been called the Landscape, Factory, Tent, Confessional, Market or Monastery. Tomorrow's workplace has its own metaphors too: Club, College, Command Centre, Laboratory or Village Street. Each model contains elements that may suit different organisations and their business functions, be they direct functions like creating, negotiating, advising, trading and communicating or indirect ones such as learning, research, resourcing or managing. The workplace has always tried to resolve potential conflicts, for example between: control and freedom, productivity and contribution, privacy and accessibility, status and function, the individual and management. The various metaphors express the different approaches that organisations have used to address these problems.
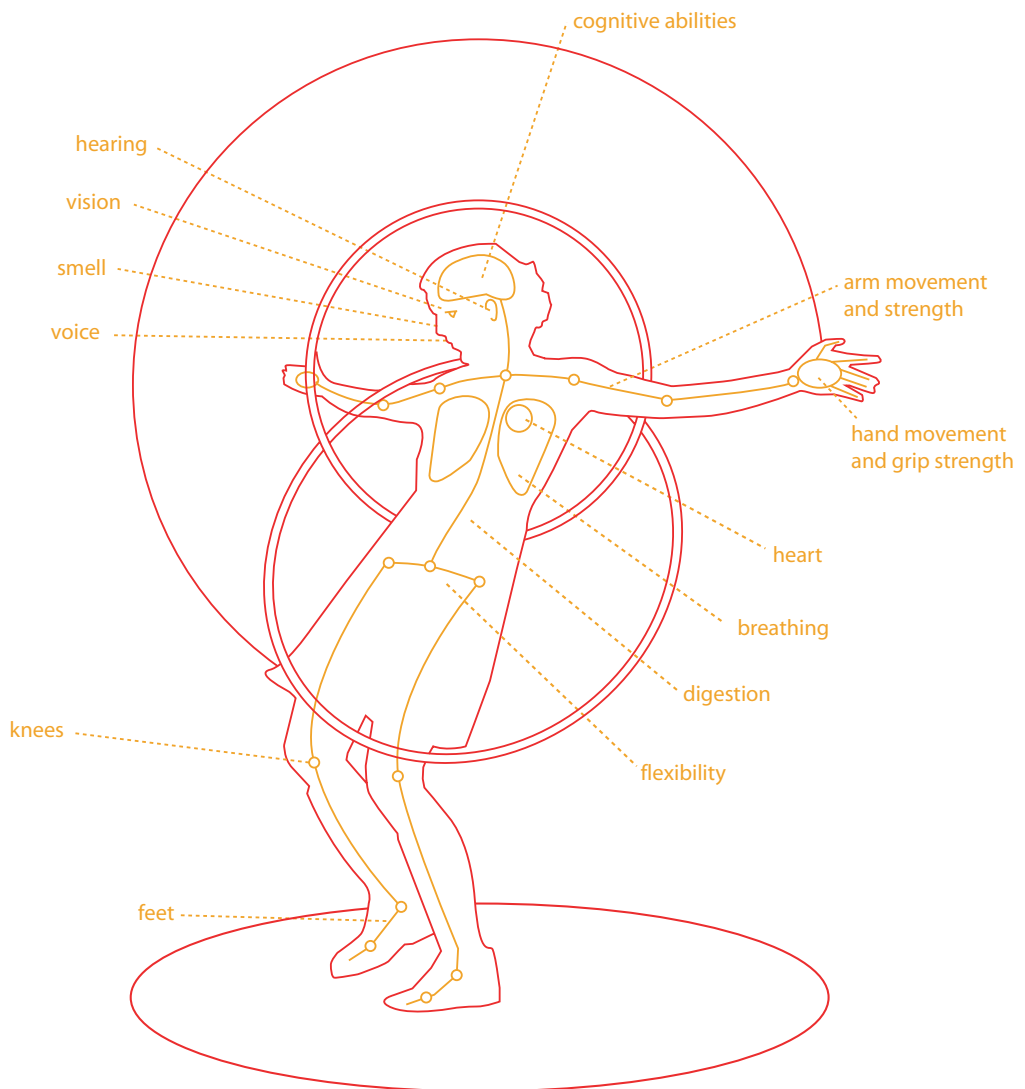
1.3 Who: Older Workers

Experience Workers

Nearly all workers use knowledge in their job, bringing unique skills and experience to bear on the task. Knowledge workers are people who analyse, create and act on information. To remain effective, these workers must grow and learn, slowly becoming 'experience workers', or older knowledge workers who have years of experience and tacit knowledge.

Who is working longer?

- The better qualified stay in work longer.

- Those who feel they are in control of their career and job changes are more likely to stay in work, and consider work after retirement.

- Even in their 60s, one in three report a job change other than retirement.

- A majority of people say they would consider working after formal retirement, but most would only do so on a part-time or flexible basis. The proportion willing to consider this rises with age until around 60, after which it declines.

- The self-employed (including professionals, skilled craftspeople and unskilled workers) are more likely to be working in their 60s and 70s than any other group, and when they do retire they are more likely than other groups to do so on health grounds.

cognitive abilities

hearing

vision

smell

voice

arm movement
and strength

hand movement
and grip strength

heart

breathing

digestion

flexibility

knees

feet

- People in large firms are more likely to take on increased responsibility and skills in their 50s and 60s than those is small firms.

Extracts from the National Omnibus

The Physical Aspects of Ageing

Our bodies change as we age. People reach full physical maturity or development at around 25. Then after a period of relative stability, our bodies begin to show signs of ageing and loss of functional ability at 40 to 50.

- *Muscular strength:* In general, people lose 15% to 20% of their strength from the ages of 20 to 60. However, every person is different and most jobs do not require a person to use all their strength. Older employees may be able to perform the same tasks as a younger worker, but they may be working closer to their maximum level.

- *Joint movement:* Ageing causes some loss of 'range of motion' and flexibility. Being less flexible or able to reach could cause problems in some unpredictable situations that require unusual movements. Highly repetitive motions can cause physical problems at any age.

- *Posture and balance:* In general people may find it harder to maintain good posture and balance. When seated or standing still, this may not be a problem. However, accidents because of loss of balance do happen more with age. Work that requires precise adjustments, strong muscular effort (including lifting and carrying), joint movements at extreme angles, or those done on a slippery or unstable surface, will be affected by poorer posture. Unexpected bumps or shocks may cause a more serious problem than with a younger worker.

- *Illness:* People aged over 65 have on average three long-term illnesses, each of which can have significant care issues.

- *Sleep regulation:* Older people cannot regulate sleep as well as they used to. How long a person sleeps, and how well they sleep, can be disrupted by changing work hours or by light and noise. Older shift or night workers might need more recovery time between shifts or extended workdays.

- *Body temperature:* Our bodies are less able to maintain internal temperatures as we age. We find it harder to adjust to changes in external temperature or heat increases due to physical activity. This change means that older workers may find heat or cold more difficult to deal with than when they were younger. It also means that if they are doing hard manual labour, they may get overheated more easily.

- *Vision:* Vision changes with age. Older workers often notice they cannot read from certain distances as well as they used to. This reduction in the "amplitude of accommodation" (the ability to see or adjust focus in certain distance ranges) is normally corrected with prescription glasses. Changes also occur in the peripheral

visual field (areas to the side of you, that you're not directly looking at), visual acuity (how exact and clear things appear), depth perception (how far away things seem), resistance to glare, and light transmission. These changes go unnoticed unless there is poor lighting or there are sources of glare. Someone might also notice that they cannot see as well when they're reading something with small text, or when there is poor contrast between the object and the background. Brighter lighting (that is suitable for the task), well laid-out controls/signage and avoiding small print are all important.

• *Hearing:* Older people may not be able to hear as well at higher frequencies (high pitch sounds). Most often, this change is noticed as the inability to listen to a particular voice or sound in a noisy environment. People who work with a lot of background noise may have difficulty hearing verbal instructions.

The Cognitive and Psychological Aspects of Ageing

Changes in mental capacity also occur as a person ages. Whilst verbal tasks and vocabulary (talking and expressing themselves) remain constant or improve, older people might not think as quickly and clearly as they once did. Generally speaking, fluid intelligence declines with age: inductive reasoning, speed of thinking, selective attention, 'dual-task' activities and information processing may all be reduced. Tasks that depend on short-term memory usually take longer and are less accurate and older workers are more prone

to forget where they have put things. Also, it may take longer to learn new skills. As a result, it becomes increasingly important to reduce demands on working memory by providing more external displays or note-taking.

Older workers tend to use experience and expertise – they naturally develop different habits to match or suit their learning and working styles – but may find it hard to work with complex or confusing stimuli. This means they might find multi-tasking situations more difficult. They may also find it more difficult to work in a busy environment where there is a lot of activity (being less sure what to prioritise, what to pay attention to, and what to ignore), especially in "new" situations.

Training requirements may be different for older workers. Since learning is based on previous experience, training may need to be more "practically" based. New skills need to be explained in a way that fits more readily into what they already know. Justification and the logic behind the information (why you're doing what you're doing) are more important. Altering interpretation of stimuli is also more difficult for older workers, even if it is subsequently proven wrong. Training may take longer than with younger workers and there may also be a need for more assistance or practice.

Everyone, at every age, thinks and learns differently. These cognitive functions -- how someone learns and thinks -- are very dependent on the individual, and the experiences they have had during their lifetime. People who have had a

lot of training or education over their lifetime, or who have had to carry out a variety of tasks, are experienced learners. They are typically able to learn new skills well and improve the ones they have with ease.

People who may be more resistant to learning as an older adult include those who have little formal training or who have carried out relatively simple or repetitive tasks for many years. They are used to doing the same thing the same way, and may find it hard to take in new information or ways of doing things. Psychological inflexibility generally increases with age: older people are quicker to develop negative attitudes to products or services that are physically or cognitively difficult to use and have decreased persistence. Conversely, they have very positive attitudes to products and services that do not present these barriers.

Health and Safety

There are a few specific health and safety concerns related to ageing workers. Older workers tend to have fewer accidents, but when injured, their injuries are often more severe and may also take longer to heal. The types of injuries can also differ. Younger workers tend to get more eye or hand injuries, while older workers who have been working for many years report more back injuries. Many workplace injuries are the result of doing the same things again and again; repetitive motion injuries, for example, develop over time. An older worker may therefore report more musculoskeletal injuries since they have had longer for the condition to develop.

When anyone, regardless of age, is pushed to work harder than they safely can, there is a risk of injury. Because older workers tend to have more severe injuries when injuries happen, it is important to make adjustments to workstations or work patterns to make them as safe as possible. It is also important to make sure a person is suited for a particular task and is safely able to do it. A well-designed workplace will benefit everyone. Workstations and job tasks that are matched to the needs of the individual employee are always best; a case of different conditions for different workers, not just people who are older.

1.4 How: Work Styles

"We work not just to produce, but to give value to time." Eugene Delacroix, artist

Management and organisational theories help shape how we work, defining the most successful models or optimum arrangements. Social factors and trends also have a profound impact on workers' expectations and quality of life issues. Facilities managers and others involved in workplace design struggle to respond to these ideas and their physical manifestation. Furniture selection and use is often key because these elements are easier to change than the surrounding architecture. So how does how we work influence work furniture design?

- *Drive for Creativity:* There is an increasing use of creative tools in the workplace beyond the ubiquitous white board and sticky note. More companies have dedicated facilities such as client project rooms, idea rooms or innovation

centres. These are also important in conveying a forward-thinking image.

- *Workplace Theatre:* Employees are being encouraged to engage more creatively with their environment and to display creativity e.g. graffiti walls or using a theatrical analogy for meetings (Roles/Stage/Set/Props/Acts).

- *Learning and Working Convergence:* Traditionally, employers have under-invested in training and teaching on the job. Increased IT usage, employees who are committed lifelong learners and the new rhetoric of the learning organisation all point to work increasingly becoming a place of learning.

- *People as Assets:* Employees are increasingly treated as assets rather than costs. Managers are more interested in a long-term vision of how people development will pay off and how the work environment can contribute to the retention of valuable staff.

- *Workplace of Choice:* Corporations that once downsized to cut costs are now talking seriously about becoming 'workplaces of choice'. People who are never without computers, the internet, or mobile phones, and who have a strong interest in opportunities for personal success and quality of life, are affecting the workspace. Environments must increasingly send messages about opportunity, the synergy of multiple minds, the value of people, the inherent strength of diversity, and, most importantly, that contribution is emphasised over individual productivity.

- *Creating Personality:* The work environment is becoming a manifestation of the company's personality and aspirations to excite the workers. It is becoming an increasingly important part of the recruitment and retention of staff, especially in providing unexpected, inspiring environments.

- *Reducing Formality:* Reduced formality and more personalisation are being driven by individual desire for more control over the environment and by a dissatisfaction with inflexible and formal environments.

- *Workplace Stress:* Work stress has significant costs for employers, employees and the healthcare system. The intensification of work through long hours, weekend and evening work, inflexible schedules, rising workloads and increased employer expectations all add up to more stress and burnout. The result is increased work-family conflict, absenteeism, and rising health costs for employers. There is also a rise in the use of prescription drugs such as anti-depressants and long-term disability. The solution lies in creating more supportive work environments, reducing job demands to reasonable levels, and giving workers more autonomy to make decisions.

- *Space Sharing:* Space sharing with other companies is becoming more common. Initiatives such as incubator schemes and satellite offices provide knowledge sharing and bring fresh ideas and people into the workplace.

- *Capacity Change:* Due to increasingly flexible business methods and attitudes to work, there is more need to design for the ability to expand and shrink the workforce quickly and inexpensively.

- *Office-Café Culture:* Cafés and breakout spaces are frequently part of new office environments. What was once only part of younger creative agencies is now common in all kinds of organisations.

- *Space Appropriation:* Office spaces are being designed around the social dynamic of different kinds of public space, such as a street, or a coffee shop. There is also more appropriation of buildings originally intended for other purposes – such as warehouses, factories, schools and barns – fuelled by less demanding technical infrastructures.

- *Creating Chance Encounters:* 'Public' spaces and circulation spaces are being used more actively in the quest for increased communication and networking within a company.

- *Flatter Hierarchies:* There is more interest in new ways to motivate employees, promote more effective team working and internal communication.

- *Semi-hot Desking:* Some workplaces get people to move around occasionally, to sit next to other people and mix; wandering and perching are also encouraged.

1.5 When and Why: Changing Workforce

The statistical facts of demographic change in the UK spell out the when and why of an ageing workforce. They also demonstrate older workers' lifestyle choices and differing expectations.

Demographics

- Life expectancy increases one more year approximately every four years.

- Life expectancy has risen by 30 years since the UK State Pension age was fixed.

- There are 1 million fewer people in their 20s than ten years ago (UK Office of National Statistics).

- There are now more people aged over 60 than under 16 in the population (2001 National Census).

- There were 9.5 million people over the age of 65 in 2002 and there will be 15 million in 2040 (Office of National Statistics).

Work

- Over 70% of people in employment would like to work after retirement age or State Pension age if they could do so part-time or with flexible hours (NOP Survey for Help the Aged).

- By 2006, 30% of Britain's workforce will work in wholly or partly from home. (The Henley Centre for Forecasting)

- Nine out of 10 people aged 50 and over receive no training from their employer at all (Employers Forum on Age).

- At least 40% of people who retired early feel that they were forced to do so against their will and would rather have continued to work (Employers Forum on Age).

- 68% of employers seeking skilled staff are experiencing recruitment difficulties (Third Age Employment Network).

- 33% of the working age population are over 50, and this figure is likely to reach 40% during the next 20 years (Department for Education & Skills).

- Over the last decade there has been an increase in employment among older people. The proportion of women in their fifties in employment increased from around 59% in early 1993 to a high of 67% in winter 2003-4. For men aged 50 to 64 the employment rate followed a similar pattern, increasing from 65% to 72%over the same period (UK Office of National Statistics).

Retaining Older Workers

- The extent to which individuals feel in control of their working lives (or perhaps their lives in general) is an important factor affecting their attitudes to work and willingness to stay in work later. Moves to increase an individual's engagement with the workplace may increase the likelihood of retention.

- Willingness to consider working longer is high for people in their 50s, but it declines rapidly for those who become economically inactive. Strategies to extend working life need to address people before they retire or very soon after.

- There are powerful cohort effects at work, with younger generations much better qualified, and much more likely to be in professional and managerial roles. With each generation, the population will therefore include a higher proportion of the kind of people who can be expected to stay in work later.

- It will be much easier to persuade well-qualified professionals and managers to continue in work.

- Those who leave work through ill-health and disability (the principal cause of labour market exit for those in their 50s) are a special group, who are especially likely to take a negative view of exit from the labour market.

- Retention in the workforce of those in routine and semi-routine occupations will probably depend heavily on their financial circumstances (both rates of pay and pension entitlements), and on their health. Retention might be improved by more focused training earlier (perhaps in their 40s), since higher qualification levels are so strongly associated with the propensity to remain in work.

- Far fewer people actually work part-time after retirement than would consider doing so, and very few people aspire to full-time work after retirement. This is particularly true of women.

- There appears to be a serious mismatch between the numbers of people who increase their skills and responsibility with job change, and the numbers who actually receive support to adapt to the job change. It is probable that training at this point would be particularly effective at raising skill levels, and that greater investment here would be productive.

- After 50 a growing proportion of people report changing jobs to reduce stress levels, and this may include a desire to increase control over working life. This issue might be addressed both by increased flexibility in working arrangements, and by moves to raise the status of older workers by recognising their contribution.

(Extracts from research carried out by The Centre for Research into the Older Workforce, Surrey University).

User Research

Why User Research?

Designing in a more inclusive way demands a people-inspired approach. The main reason for conducting user research is to allow the insights gained to shape design thinking. This is to avoid making the assumptions that can result in poorly conceived solutions. User research is a valuable source of inspiration for designers; after all, everyone is an expert on their own lives and needs. So, the short answer to the question of why we should conduct research with users: because it's for them.

Research Methods

Research exercises were designed to give both breadth and depth to the findings. Methods were chosen to gain insight that extended beyond just personal speculation or statistical data. They focused primarily on deriving qualitative inspiration as opposed to quantitative information more familiar in scientific research. A selection of the research carried out is documented below.

Research Visits

The research started with a number of visits to different types of office environment to observe and record how people organise and use these spaces. These ranged from state-of-the-art offices for large corporations to small offices in converted houses for law firms to old industrial buildings for creative businesses. The material gathered formed a catalogue of settings and examples of furniture in use. Visits were also made to furniture factories to

look at the process of manufacture and understand some of the parameters addressed by designs currently in production. Visits to showrooms and museums served to illustrate the issues that shape the evolution of work furniture typologies.

Expert Interviews

People with particular expertise in workspaces were consulted to gain understanding of the key drivers shaping the contemporary workspace. These included: furniture designers, architects, management consultants and facilities managers.

Assessment Tools

During the research it became important to comparatively analyse existing designs in order to learn from them and critique them from an inclusive design perspective. Two graphical tools were developed to enable these comparisons.

The Questionnaire

An interactive and visually engaging questionnaire was designed to solicit a range of user feedback. It consisted of six sets of questions exploring: working habits, the nature of users' workspace, their workstations, their working methods, the things they use, and how they interact with others. Some of the questions were purposefully made esoteric or open-ended to provoke more individual responses. Simplified questionnaires were also used for those with less time. All were made accessible online. Analysis of the questionnaire was based on 35 fully completed responses.

Above: Expert interview with Rune
Karlsson, Head of Design at Kinnarps
Below: Visits to factory and office sites
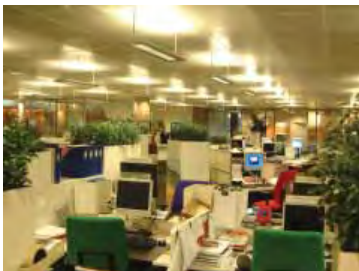
The Probe Pack

The probe pack included: a ten-page workbook of exercises related to working habits, a disposable camera and a booklet of instructions. Ten probe packs were produced. These were sent to a variety of office workers to gain insight into their particular workplace, furniture and habits.

User Interviews

In-depth interviews were conducted with ten users in their own workplaces, typically at their own desk and involving a survey of their wider workspace. The user interviews proved the most effective method in driving the research forward and became the central focus of the investigation. Some users were chosen specifically because of more extreme needs, desires or habits. This was a tactic used to help challenge social stereotypes. The user interviews consisted of structured conversations with individuals over 50 from a range of different user groups, including:

- *Visually impaired workers:* Users who have a greater need to categorise, organise and navigate the working experience. People who need greater help using work materials and tools. Both blind and low-sighted users were interviewed.

- *Mobility impaired workers:* Wheelchair users, arthritis sufferers and others who have lost mobility in parts of their body have more difficulty with reach and access.

- *Mobile workers:* Moving from client (corridor warrior) to café to train to HQ to car (road warrior), these people often carry mobile devices and access wireless computer services in public or semi-public spaces. Older workers are often part-time, flexible workers.

- *Home workers:* People who often have idiosyncratic working practices and customise their workspace to a high degree. Older workers especially desire greater control over their working conditions.

- *Specialised workers:* People who need and expect more from their environment in the way it supports their activities. They often use more specialised equipment and adapt their work setting throughout the day.

- *Workaholics:* Those who don't take breaks and often have more problems controlling stress. This also includes people using a computer for prolonged periods.

- *Cellular office workers:* People who are solitary or work in small groups. They have good control over their environment and are used to a high degree of acoustic and visual privacy.

- *Open plan office workers:* Those who often have limited space and control of wider environmental conditions, who are subject to more frequent interaction with others.

Above: Interactive Questionnaire
Right: Workstation Assesment Tool

DESKING
DIMENSIONAL RANGE
FLEXIBILTIY FOR PLANNING
AVAILABILILITY OF HANDED WORK SURFACE
PANEL HUNG WORK SURFACE
DESK -MOUNTED OVERHEAD STORAGE
HEIGHT ADJUSTABLE
SLOPE ADJUSTABLE
LEVELING ADJUSTMENT (QUALITY AND EASE)
CONSTRUCTION (FRAME, FINISHES, TRIM)

CABLE MANAGEMENT
LAY-IN
EASE OF ACCESS
JUNCTIONS AND RADII
POWER, DATA, VOICE OUTLETS
EASE OF RELOCATION AND EXPANSION
SUPPLIER INSTALATION

DESK PEDISTALS
RANGE OF PEDISTALS
MOBILE PEDISTALS
RANGE OF INTERNAL FITTINGS/ACCESSORIES
CONSTRUCTION (FRAME, FINISHES, TRIM)
DRAW MECHANISM QUALITY
SUPPLIER INSTALATION

SCREENS & PANELS
DIMENSIONAL RANGE
VARIABLE HEIGHT AVAILABILITY
ACCOUSTIC PERFORMANCE
CURVED OR GLAZED OPTIONS
EASE OF ASSEMBLY
LEVELING ADJUSTMENT (QUALITY AND EASE)
COSTRUCTION (FRAME, FINISHES, TRIM)
PANEL HUNG ACCESORIES

MAINTENENCE
EASE OF CLEANING
WEARING QUALITY OF SOFT SURFACES
EASE OF REPLACEMENT OF FABRICS
EASE OF FLOOR CLEANING UNDERNEATH
HIGH INTERCHANGABILITY OF COMPONENTS
LOW RECONFIGURATION COSTS
EASE OF IN-HOUSE RECONFIGURATION
EASE OF STORAGE
DURABILITY

FINISHES
CHOISE OF WORKTOP FINISHES
ANTI GLARE FINISHES
RANGE OF FINISHES
RANGE OF FABRICS
CONTINUITY OF FINISHES AND FABRICS

RANGE
INCLUDES ALL ITEMS REQUIRED
DIMENSIONAL RANGE
ADAPTABILITY
READY ASSEMBLED OR 'KNOCK DOWN'
METAL OR TIMBER BASED
INTEGRAL TASK LIGHTING
INTEGRAL ENVIRONMENTAL CONTROLS
FIRE AND WATER DAMAGE RESISTANT
AVAILABILITY AND SUITING OF LOCKS
IMAGE APPROPRIATE TO ORGANISATION
CONFORMITY TO REGULATIONS
SPECIALS AT NO EXTRA COST
PERFORMANCE GUARANTE
EASE OF DILIVERY
CONTINUITY OF SUPPLY

STORAGE
DIMENSIONAL RANGE
HEIGHT RANGE
RANGE OF INTERNAL FITTINGS AND ACCESSORIES
FILLING SYSTEMS (LATTERAL/PULL-OUT)
COAT STORAGE
WIRE MANAGEMENT (YES/NO)
LEVELING ADJUSTMENT (QUATITY & EASE)
CAPABILITY OF RELOCATION WHILST LOADED
CONSTRUCTION (FRAME, FINISHES, TRIM)
FIXING TO PANEL
PITCH OF FIXINGS
LOCATION OF HANDEL AND LOCK
INTERCHANGABILITY OF BACK PANEL

PANEL HUNG STORAGE / SHELVES
DIMENSIONAL RANGE
RANGE OF INTERNAL FITTINGS & ACCESORIES
FILLING SYSTEM (LATERAL/PULL-OUT)
CONSTRUCTION (FRAME,FINISHES, TRIM)
FIXINGS TO PANELS
DOOR MECHANISM QUALITY

SUSTAINABILITY

Listen and Learn

During the interview people were asked to give their personal viewpoint on six areas related to work and work furniture. Each interview was filmed to allow later analysis in relation to the concepts subsequently developed.

The first area addressed personal aspects of working, asking questions such as:

What has changed about your experience of work with age? What do you wish you had more control over at work? What most affects your health at work? Have you ever injured yourself at work?

The second area interrogated opinions of workplaces. People were asked, for example:

What contributes to the amenity of where you work? How many places of work do you have and where are they? Which places best suit different activities? Do you have particular sensitivities to environmental conditions?

The third area looked at people's experience of using work furniture. For example, participants were asked:

How do you personalise your space? How do you create privacy? How adaptable is your work furniture? Is there anything broken, repaired or adapted?

The fourth area asked questions relating to how people work, such as:

What helps you organise and what helps you remember? What do you do at your workstation apart from work? What single thing most impedes the way you want to work?

The fifth area looked more in detail at the things people use whilst working, particularly at workstations:

What personal items do you store at work? What at work do you find hard to use, manipulate, lift or adjust? What work-related objects do you carry? Apart from computers, what is your most useful tool?

The sixth area looked at the user's interaction with others in the workplace. The interviewees were asked questions such as:

How do you share what you know with others? Is there anything at work that helps you share? Describe your best team-working experience?

Particular insights and conclusions from the interviews are addressed in the next chapter, which summarises the findings from all the research methods used.

Top: Workplace Probe Pack
Below: user interviews in the workplace

Findings

The material gathered during the research phase of the project was assessed to uncover common themes and reveal ways of understanding the older worker.

About Work Furniture

Many visits to showrooms, factories and workplaces helped form an understanding of the direction contemporary work furniture is taking.

- *Mobility:* An increasing desire for more flexible environments. Products are increasingly lightweight and on wheels or castors.
- *Ergonomics:* An increasing awareness of posture and different working preferences of users. User-controlled adjustment is gradually moving from chairs to other office objects, for example height-adjustable tables creating sit-stand solutions.
- *Flexibility:* An increasing drive to make the furniture do more and have a multiplicity of uses. Products are more multi-functional, modular and reconfigurable. They can temporarily transform space, often to enhance collaborative experience. Some solutions use the metaphor of theatrical stage sets.
- *Informality:* Utilitarian designs with uniform and neutral colours are being replaced by more domestic designs and with more varied use of materials and softer forms. Many furniture manufacturers now cater for home working.
- *Scenery:* Character micro-environments are emerging e.g. the caravan as a meeting room.
- *Less Barriers:* More lines of sight to make communication more direct.

- *Space Management:* More sophisticated systems for using space – web-bookable meeting rooms, dynamic allocation of workspaces.
- *Simplicity:* The technical requirements of work furniture are decreasing. Wireless networking, flat screens and laptops are resulting in: reduced cabling, a smaller equipment footprint on the desk and less load-supporting requirements.
- *Smaller and Bigger:* A wide variety of workstation sizes are more dictated by activity: from an armature to hold a laptop to giant studio workbenches for assembling things.

About the Workplace

- There is often insufficient space for face-to-face interactions
- Most interactions (ad-hoc meetings or collaborative working) involve just two or three people.
- Many people don't need the enclosure, bigger desk or indeed, the desk they thought they needed.
- A worker's perception of control and comfort influences their productivity.
- There is often a lack of forums at work for employees to voice their opinion or have discussion about their work setting.
- The ability to easily make or break contact with people often determines the perceived success of workspaces for its users.
- Workspace design is dominated by the workstation as the focus of individual work.

About Older Workers

- For many, things don't change drastically with age, although some things become more difficult and tolerance for ineffective environments drops markedly. For others, health problems and resulting life-style changes have a profound effect on their ability to function well in conventional workplaces.
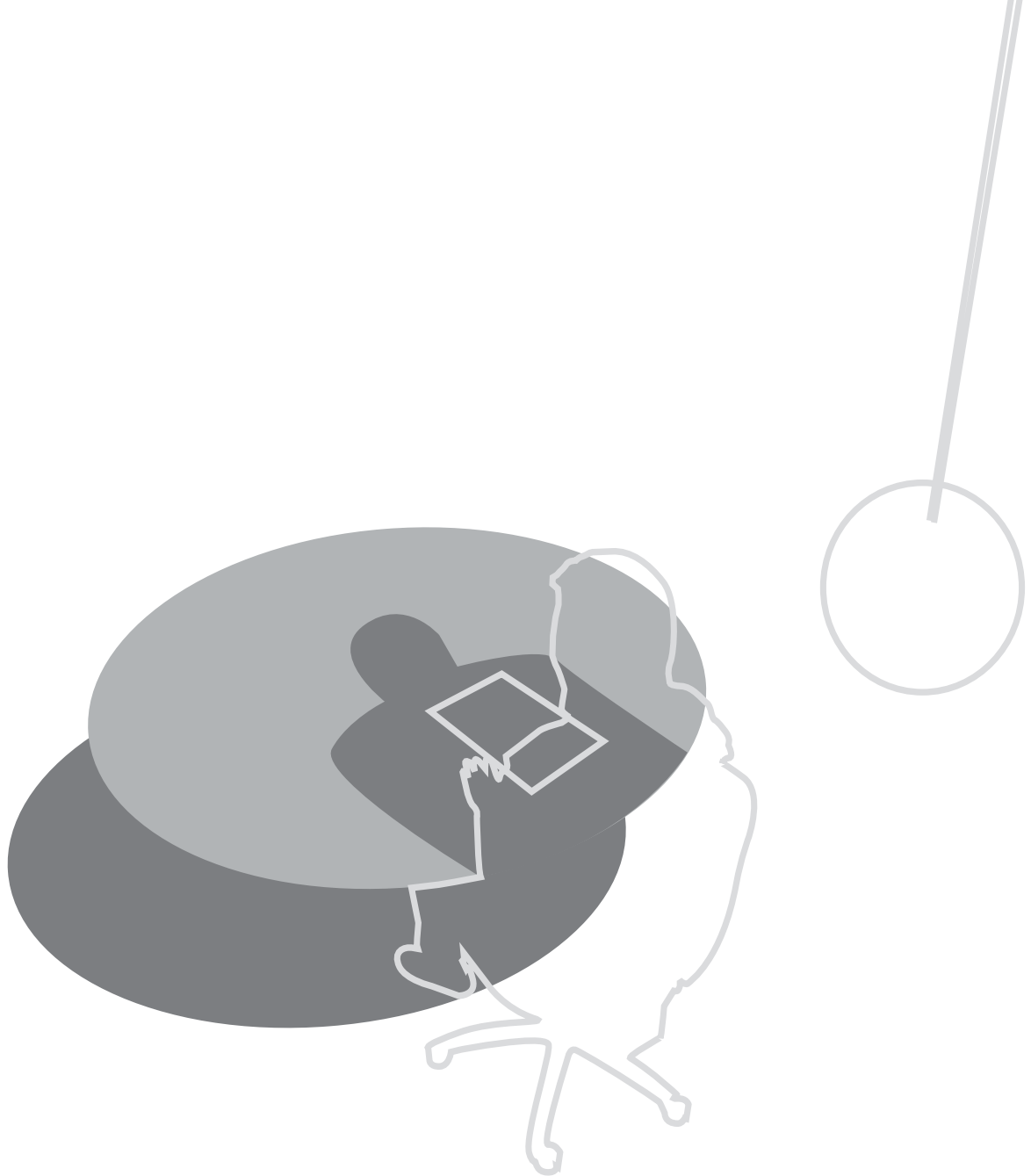
Older Workers:

- Are increasingly asserting their demand for products that fit into their daily lifestyles.
- Have more flexible working habits and demand more choice in the how, when and where of working.
- Often value connection to people of all ages.
- Are more open to mixing work and personal projects.
- Need more space and time for reflection, particularly when freelancing or hot-desking.
- Have an increased desire for connection to natural 'green' environments.
- Prefer their work be physical not just on the screen.
- Want easy control over the access to or separation from ubiquitous office technology.

Key Findings

The following nine key findings are split into three sections:

- Desk Work: Findings related to being at the workstation.
- Mobile Working: Findings related to older workers becoming increasingly mobile and working in new places.
- Proactive Healthcare: Findings related to health, well-being and personal development in the workplace.

Older workers often feel unable to change aspects of their immediate environment that are important to them.

The older we get the less able we are to thermo-regulate our body, which means that older workers find maintaining thermal comfort more difficult and often feel too hot or too cold. Vision also changes: older workers need and prefer greater levels of task lighting, exactly where it is needed. Glare from natural, general and task lighting is more of a problem and careful attention has to be given to how lights are placed. Ideally, more control should be given to the individual. The research found that there is often a conflict between architecturally fixed lighting and the more frequently changing sceneography of the workplace, particularly with the prevalence of mobile furniture in contemporary workspaces. As we age, our hearing changes and we become less sensitive to higher frequencies. Most often this change is noticed in the inability to listen to a particular voice or sound in a noisy environment. This problem is compounded by greater levels of noise resulting from new ways of working experienced by many of the users, involving communal desking arrangements, higher densities of occupation and increased in-building mobility afforded by wireless systems. The research also found that appropriate access to and separation from technology is an important consideration for older users.

"It was three months before we realised we could move the lights to a better position."

"I get distracted by conversation a lot, so sometimes I use earplugs."

"I always have glare on my screen and where the lights are means I cast shadows on what I'm doing."
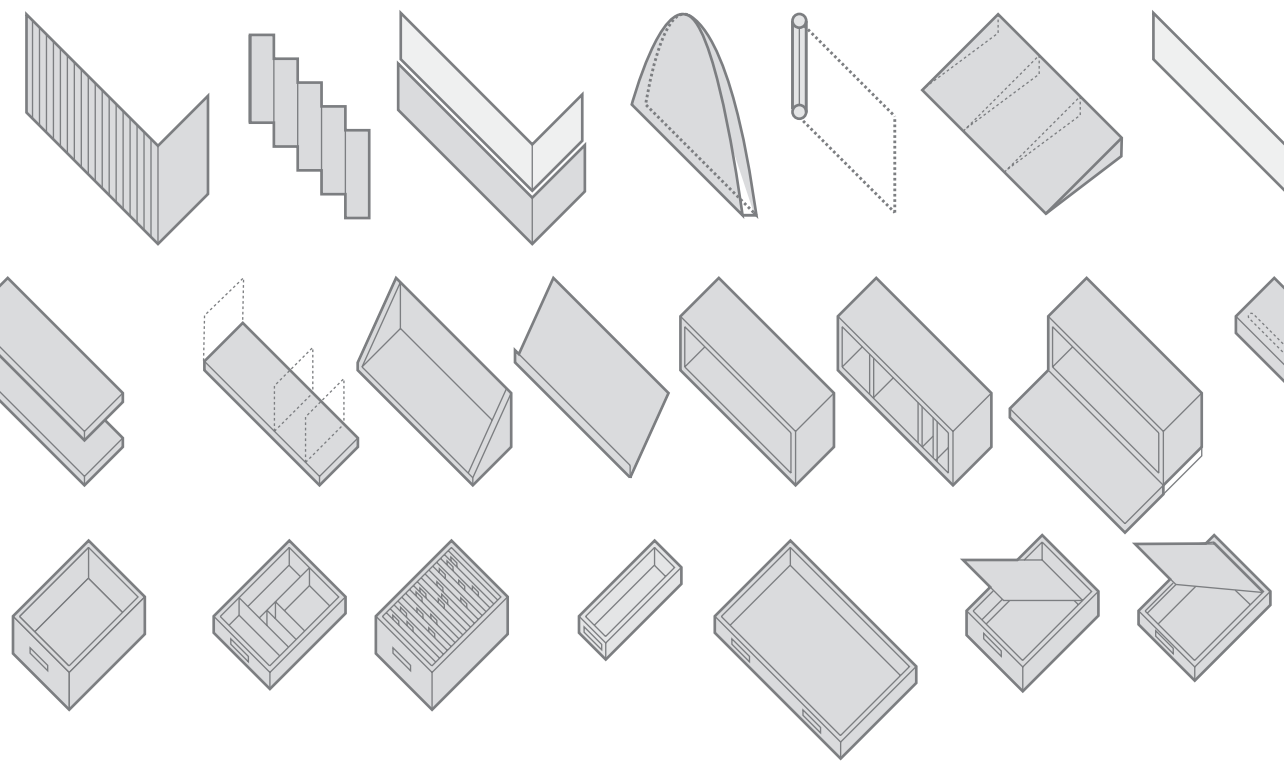
Older workers are made victims of simple usability problems.

As we age, the body loses some 'range of motion' and flexibility. Being less flexible or able to reach can cause problems in situations that require unusual movements, for example locking wheels on mobile furniture, re-routing cables or accessing high shelving. Ease of use is a vital consideration if you have disabilities or use special equipment, but added attention to interface usability will also benefit all. Usability of different elements can be analysed in terms of:

- The position of controls e.g. locating the switch for a task light on the lampshade, not on the cable.
- Size and space for approach and use.
- How actions of controls are communicated and whether they are compatible with a variety of techniques; whether or not they are intuitive.
- Whether or not they can be used efficiently and comfortably and with a minimum of fatigue.
- The minimisation of the consequences of accidental or unintended actions and the provision of failsafe features.

" It's difficult to wire cables under the table or plug things into the back of my computer."

" I hate the wheel locks on this table: they are just too difficult to use with your foot."

" I stand on a box to reach the high stuff, not ideal, just how it is."

People fail to use their work furniture properly and don't benefit from its ergonomic features. Similarly, they have difficulties in maintaining good working habits. This problem is of greater consequence to older users.

Older workers who have been in the workplace for many years report more back injuries and have an increased incidence of musculoskeletal problems since they have had longer for the condition to develop. Older workers are more prone to work-related injuries and it takes them longer to recover. It is more important that they pay attention to how they are working, and for how long, so that they can make adjustments to their working conditions or patterns to avoid injury. In general older people may find it harder to maintain good posture and balance. When seated, balance may not be a problem, but work that requires precise adjustment, increased muscular effort or joint movement at extreme angles is affected by poorer posture. The research found that even though older workers had been tutored in the correct use of their chair's ergonomic features, that knowledge quickly faded and bad habits continued.

Work furniture designed with some thought to psychological ergonomics can afford users little daily pleasures. Older generations inevitably have different ways of processing, thinking and perceiving, based on their formative cultural context. Attention to the psychological ergonomics of work settings can help with changes that occur in learning and cognitive abilities of older users. Generally speaking, fluid intelligence (such as inductive reasoning, selective attention, 'dual-task' activities,

and information processing) declines with age, while verbal tasks and vocabulary (talking and expressing yourself) remain constant or improve. Tasks that depend on short-term memory usually take longer. Older workers tend to use experience and expertise when working and may find it hard to work with complex or confusing stimuli. This means they might find it hard to do tasks in which they have to do (or think) a lot of different things quickly or at one time. They may also find it tricky to work in a busy environment where a lot is going on. Older workers benefit from aids to organisation and memory.

"I was told how to adjust my chair by a specialist who came round, but I can't remember exactly how to do it."

"Too many knobs and levers on this chair, I just end up tipping it upside down to figure out what works what."

"I don't really take breaks unless someone asks me to go for a coffee."

Older workers often work on a part-time or flexible basis. This means they are more likely to hot-desk or use generic, non-owned workstations in the office. This runs counter to an increased desire to work in a way more tailored to their specific needs and preferences.

Part-time working, hot-desking and distributed working results in people being in different locations at different times. Workstations and chairs are not owned by the user and are not set up for specific use by them. Whilst this might be more acceptable for short-occupation touchdown areas, lack of individual ergonomic configuration is a major problem for hot-deskers who stay for longer periods. The research found that older workers are sensitive to lack of personal control, absence of privacy, inadequate space and lack of ways to personalise their workspace. Many complained of smaller work areas and thought they would work better with more space.

There is a need to create better temporary work settings that can expand and contract to suit the user's needs. Accessories and areas allowing personalisation or display are the main concessions to the customisation of work furniture, but they are less applicable to hot-desking. Though some older workers expressed less of a need to personalise, they tended to be those spending a high proportion of their time working at home. The ethos of hot-desking can also result in sterile working environments. An emphasis on neutral space and clean-desk policies can create de-humanising environments with little joy in materiality or characterful idiosyncrasies. 'Musical chairs' can

result in damaged bodies because different people have different needs, both physically and emotionally.

"I have a home office which I love because everything is just as I want it. At my client's office I just get a bench and have to make do."

"I end up using all kinds of chairs during the day, not exactly good for my back."

"Hot-desking areas are often tucked away, leftover spaces. You don't exactly feel special using them."
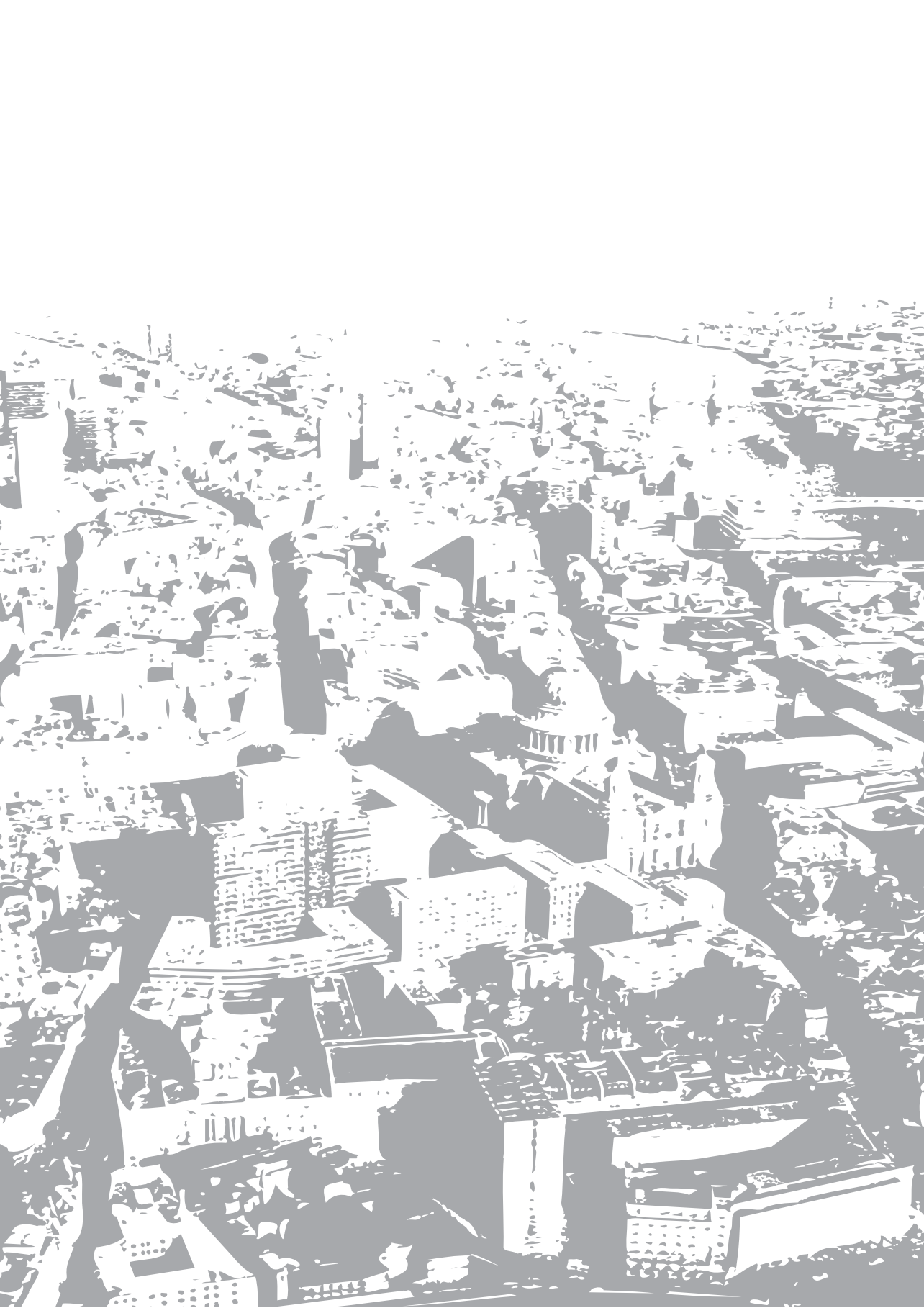
Work is increasingly conducted away from the workstation and in settings outside the office that offer inadequate facilities.

Older workers have increasingly flexible working habits, which mean they are more frequently working outside their own office environment. A higher proportion of older workers are in consulting or client-facing roles, which again translates into increased mobility. Older workers are less tied to their desk, instead using a multiplicity of work surfaces in different kinds of environments such as: cafés, public places and outdoor spaces. Where traditional workstation design focuses on providing ever-better working arrangements, all this has been lost in new models of distributed working on the move and in the home. It is not uncommon to see people working for extended periods at furniture not designed for that use. This has clear ramifications for user satisfaction and health.

"I work a lot more at the library because it's a quiet place to get on with something productive whilst waiting for a meeting."

"The café over the road has people who seem to work there almost all day."

"Sometimes I go to the park with my laptop to write just because I can."

Older workers are adopting more mobile working habits that can have adverse consequences on their health and well-being.

The research found that mobile working and the need to carry equipment and materials was a common cause of problems. Weight is the primary issue with the associated risk of strain or injury when moving around. Feeling secure when carrying or using valuable equipment was also a problem; there was concern that stuff could be mislaid. Some users found that mobile working had adversely affected their work-life balance; the problem with work being where you are is that it becomes harder to stop working. Working in-transit is generally more difficult and older workers expressed interest in solutions that aided this.

"I pulled a muscle in my back trying to lift my bag of equipment onto a train."

"I hate having to lug my work stuff around so much; it's just so heavy."

"These days my office is in a bag."

Older workers are interested in health issues and are open to innovation in this area. There is little beyond ergonomically-designed seating that promotes more healthy and active working habits at the workstation.

The majority of older workers interviewed complained of physical and mental tiredness at the end of each working day. Many suffered with tired eyes and an inability to take their eyes off the screen, causing 'screen fatigue'. Some employed strategies such as printing documents to read on paper, purely as a break from the computer. At least half had experienced a repetitive strain injury.

There is a growing awareness of health in the workplace, driven partly by regulations and partly by an increased awareness of healthcare issues via the media. Some workplaces have instigated 'workplace wellness' schemes focusing on health enhancement activities in relation to employee productivity (aimed mainly at stress management). There is an emergent push and demand for proactive preventative healthcare solutions that move routine health and wellness from the hospital and doctor's surgery to the home, workplace, retail setting and all places that impact people's decision-making and behaviour everyday (tackling issues at the site of the problem). The research found that older users thought that more proactive healthcare at the workstation could only be a good thing. So what are the tools and resources that can be mobilised to innovate in relation to health and productivity?

Opportunities exist in areas such as: body monitoring, stress monitoring, tele-medicine, interactive healthcare tools and lighting for health (for example, lighting which addresses Seasonal Affective Disorder or improved day lighting). The design of healthcare systems to improve health within the workplace revolves around empowering individuals as they age with the knowledge and skills necessary to make better health decisions and the tools to manage conditions. One word of caution about 'nannying': most respondents thought that healthcare interventions, though welcome, should be subtle and provide information in ways that are not overly assertive.

"I've had to start monitoring my heart rate and blood pressure, I keep the monitor in my drawer at work and take a reading before I start work."

"Work subsidises our membership to a local gym if we want it. It tends to be the older people who go most from our office."

"You don't normally think about your health at work, you just get on with it. It's more when you get home you realise how bad you've been feeling."

Provision of amenities is often minimal, unimaginative and unrelated to the culture of the organisation. This hinders the adoption of more healthy working habits by older workers.

The research revealed that older users find it difficult to take breaks. This was related to the lack of places to go or simply that the settings were uninspiring. Consequently people do not take enough breaks from sitting, change posture or stretch. Nor do they afford themselves recuperative breaks mentally, as there is little time for reflection when places for reflection are so inadequate or absent.

Research also revealed that older workers expressed a desire for some kind of daily contact with nature and the outside world. This connection could be as simple as seeing the sky more, having a sense of the weather, experiencing the light changing through the day, and so on. Generally older users expressed preference for more multi-sensory working environments, particularly with tactile qualities. This appeared symptomatic of increased screen and keyboard usage.

This lack of appropriate amenity spaces or facilities is particularly prevalent in city-centre areas, probably due to the value of the office space and the need to maximise the efficiency of its usage. General provision of amenities typically includes: hot and cold drinks machines, rest and first aid areas, changing rooms and showers, secure parking for cycles etc. For individuals, the most common attempt to improve the work environment is the pot plant. Pot plants tend to be dead or dying,

normally because one person takes responsibility for watering the plants and if that person is absent for a period, the plants go uncared for.

The research also found that people do many things at workstations other than work. Older workers often ate, and sometimes napped, at their desk. Older people cannot regulate sleep as well as they once did. How long a person sleeps, and how well they sleep, can be disrupted by changing work hours or by light and noise. The impact on older workers is especially a concern for night workers or those regularly working extended hours. They might need more recovery time between work periods or extended workdays.

"Most days I just have a sandwich at my desk."

"Can't see the outside from my desk, can't see the sky, watch the weather or sense the time of day. In the winter it can make you quite depressed."

"There is nowhere to sit, you just make a drink and take it back to your desk, sometimes we stand outside where the smokers go."
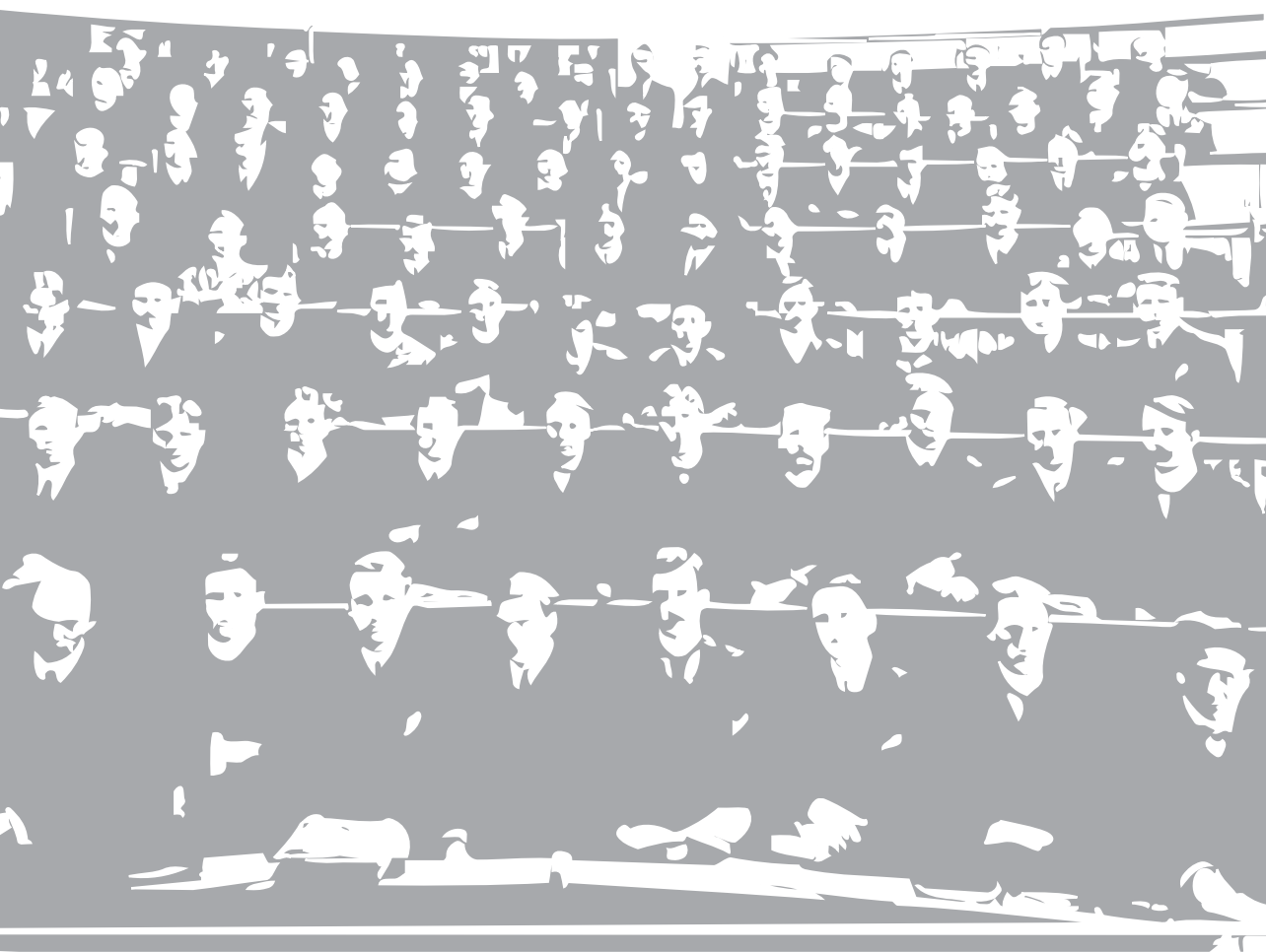
Older workers see sharing knowledge as one of the key ways to connect with people in the workplace. They are also interested in continued learning for their own development and welcome facilities to aid this.

The role of the office is changing to reflect knowledge-based and innovation-driven models of work. Offices are becoming more like university campuses, places of learning and clubs for discussion. Older workers are valuable sources of tacit knowledge of vital importance to the functioning and culture of their organisations. Finding new and engaging ways to fuel knowledge-sharing is a growing area of concern for most companies. With this in mind, some have schemes such as company blogs or formal mentoring arrangements that help maintain the collective memory and narrative of the organisation. Creating and improving settings to share knowledge is a fundamental goal of the contemporary workplace.

"I might be an old dog but I still like learning new tricks."

"I run lots of in-house seminars and discussion groups. It's a good way to get everyone together, away from computers and phones."

"I think most of us accept that we never stop learning and re-training ourselves. It can be tiring but on the other hand it does make life more interesting."

Summary of Findings

1 Older workers often feel unable to change aspects of their immediate environment that are important to them.

2 Older workers are made victims of simple usability problems.

3 People fail to use their work furniture properly and don't benefit from its ergonomic features. Similarly, they have difficulties in maintaining good working habits. This problem is of greater consequence to older users.

4 Older workers often work on a part-time or flexible basis. This means they are more likely to hot-desk or use generic, non-owned workstations in the office. This goes against an increased desire to work in a way more tailored to their specific needs and preferences.

5 Work is increasingly conducted away from the workstation and in settings outside the office that offer inadequate facilities.

6 Older workers are adopting more mobile working habits that can have adverse consequences on their health and well-being.

7 Older workers are interested in health issues and open to innovation in this area.There is little beyond ergonomically-designed seating that promotes more healthy and active working habits at the workstation.

8 Provision of amenities is often minimal, unimaginative and unrelated to the culture of the organisation. This hinders the adoption of more healthy working habits by older users.

9 Older workers see sharing knowledge as one of the key ways to connect with people in the workplace. They are also interested in continued learning for their own development and welcome facilities to aid this.

1 Improve individual choice and control over the immediate environment. Integrate more aspects of environmental control into work furniture.

2 Improve the usability of standard elements of work furniture.

3 Make ergonomic features more accessible and encourage people to act more proactively in fitting the environment to their needs. Build-in everyday prompts to correct ergonomic use, as opposed to relying entirely on a one-off session with an occupational health specialist.

4 Develop solutions that allow the quick and meaningful personalisation of neutral space. Design systems to help manage the sharing of workspace.

5 Make new places of work better for the user by applying thinking normally reserved for specialised workstations to these new settings.

6 Provide integrated mobile working solutions that are sensitive to older users' needs.

7 Integrate body monitoring and preventative healthcare technology into work furniture. Introduce new health-centred elements in the workplace.

8 Create new kinds of compact amenities and facilities beyond the water cooler and the pot plant.

9 Incorporate knowledge-sharing technologies and affordances into the fabric of the workplace.

Top: A scene from the Italian film *Il Posto* by Ermanno Olmi

Following the research phase, a series of designs were developed to act as exemplars of an inclusive approach addressing the issues found to affect older workers. Early designs were quickly developed in sketch and model form to gain further user input on the proposals. Feedback was gained through an online interactive questionnaire and one-to-one interviews. This enabled an iterative development of the designs in an attempt to come closer to better solutions for older workers.

Design Principles

The designs focused on three main principles:

- *Prevention:* How can a design stop problems occurring in the first place?

  For example: by promoting the right working posture or encouraging users to take recuperative breaks.

- *Enhancement:* How can a design help make a user's experience better?

  For example: by helping users to organise, manage time, work with others, prevent accidents and maintain good working habits.

- *Compensation:* How can a design compensate for problems in use by being flexible and offering alternatives?

  For example: by providing appropriate size and space for approach, reach and use regardless of the user's body size, posture or mobility.
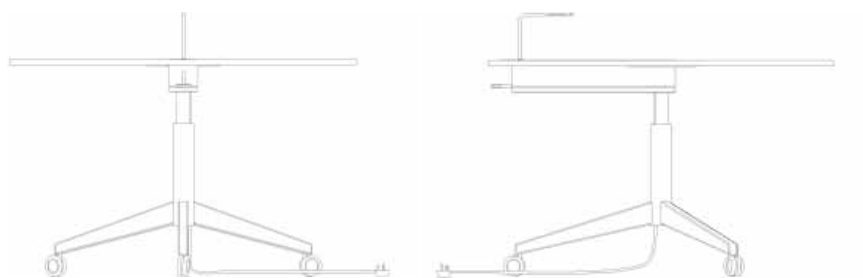
Brief: Improve individual choice and control over the immediate environment. Integrate more aspects of environmental control into work furniture.

CASTRO is a meeting table for up to five people that allows greater control over the immediate environment. It addresses several common problems with the use of mobile (multi-location) furniture in relation to fixed architectural services like power and overhead lighting, which are rarely in ideal locations.

The wheels are locked or released by a low-effort hand leaver located just below the table surface. This affects all wheels simultaneously and does not require reaching for castor locks under the table. A single cable can be dropped from the central support column using the integral cable wind. This provides power to the well and light. Once in place the table can be adjusted in height, using buttons visible on the main surface. This provides customisation for a range of working styles and body sizes. Integrated lighting folds out of the cable well to provide lighting to the main area of interaction at the centre of the table. It also lights up the well to help in finding power sockets.

- Easy locking and levelling with surface-level hand lever that locks or releases all castors simultaneously with one-handed use.
- Integrated and adjustable high brightness LED surface and cable well lighting.
- Cable well with contrasting cover that removes surface cable clutter and can be accessed one-handed. Well also allows storage of stationery items.
- Central column cable management with auto-retracting action to reduce cable trip hazards.
- Height-adjustable surface with precise button-operated electrical linear actuator or gas strut mechanism.
- Stable legs with reduced chance of under table collision or problems for wheelchair users.
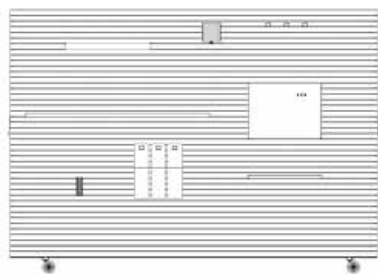
Brief: Improve the usability of standard elements of work furniture.

AQUA is a translucent screen system for acoustic and visual control in open plan work settings. It improves the usability of standard screen systems by being lightweight, rigid and easy to move.

Most office screens are fabric backed, heavy and opaque elements, that reduce visual permiability and create dark spaces. Aqua's recording studio-grade sound absorption is delivered by its uniquely profiled and translucent polycarbonate panels which help eliminate distracting sounds whilst allowing light through. Cable management is intergated into an easy access tray; the screen can also support low-energy task and display lighting at the user's preferred height.

- Translucent, rigid and lightweight acoustic screen with excellent sound absorption properties. Reduces visual impact, and allows natural light penetration whilst creating a high level of acoustic and visual privacy.
- Easy-to-use wheel-locking system with intuitive green/red signalling. Controls are located at an easy-to-use height and act on all wheels for added stability when locked.
- Can be nested together for storage.
- Integrated 'slide mount' system for supporting and repositioning a number of accessories such as hooks, display elements, shelves and files at different user-selected heights.
- Modular system for creating screens of different heights, in 200mm increments.
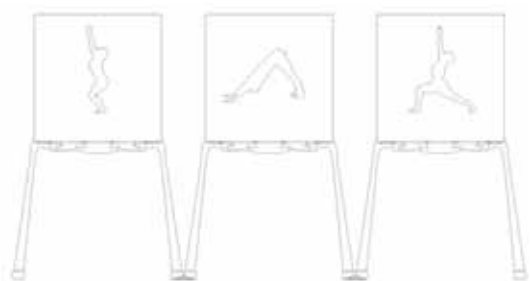
Brief: Make ergonomic features more accessible and encourage people to act more proactively in fitting the environment to their needs. Build-in everyday prompts to correct ergonomic use, as opposed to relying entirely on a one-off session with an occupational health specialist.

STRETCH is a series of stacking chairs that visually prompt more active working habits. The stretch chairs remind and encourage users to take periodic breaks from sitting and ease aches through light exercise.

The Stretch chair is designed to be a graphic communication and talking point. Seen in rows the chairs create a strong visual image of the body in motion. Arms help movement into and out of the chair and provide support of small worksurfaces for taking notes or working on portable devices.

- Lightwieght, durable and comfortable.
- Arms for comfort and for aiding body support when sitting into or standing out of the chair.
- Easy to use chair foot linking mechanism to help form rows.
- Optional arm-mounted working surface with integrated low-enegy lighting for low light note taking.
- Optional seat cushions with underseat storage.
- Optional seat storage trolley for easy movement of up to 25 chairs at once.
- Available in a range of colours and with 12 different stretch poses.
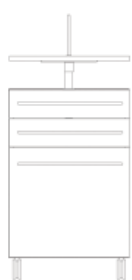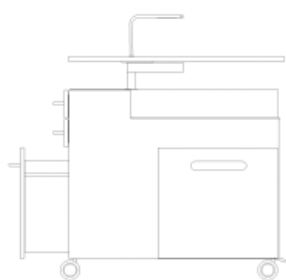
Brief: Develop solutions that enable the quick and meaningful personalisation of neutral space. Design systems to help manage the sharing of workspace.

NEMES is a furniture concept for user customisation in hot-desking settings. It incorporates personal storage, working aids and tools for personalising non-owned space.

Nemes works as an under-desk pedestal containing all the items that a hot-desking worker needs. The top raises to form a secondary work surface, revealing a lift-out tray for personal items and frequently used stationery, which can be placed on the desk. It has a selection of drawers for small items and filing. To its side is a 'personal' drawer, which allows the secure posting of personal mail. It incorporates a sitting area for short-stay meetings at the desk. It is highly mobile in all directions and is moved with a retractable handle for ease of steering. The integrated cable and power management means that it can charge items such as phones and laptops when stored overnight.

- Small and manouverable storage cart for easy positioning with retractable handle.
- Lift-out tray for personal items often used at the desk. Lifting the tray reveals an integral 'perching' area for quick meetings at the desk.
- Integrated height-adjustable work surface for use as a side table to provide extra working area or when other surfaces are not available. Wide range of motion for optimum positioning.
- Stores compactly under standard tables.
- Integral power enables charging of mobile phones and laptops even when stored.
- Side-located 'personal' drawer with 'letter box' handle for personal mail.
- Integrated signage area for name or photograph.
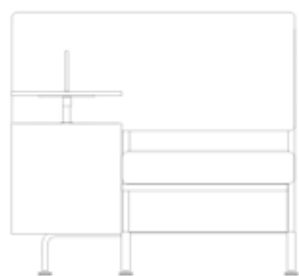
Brief: Make new places of work better for the user by applying thinking to these settings normally reserved for specialised workstations.

HEMET is a stand-alone solution for working in public spaces. It provides a comfortable and compact working concept for older workers away from the office.

Work in public or semi-public places such as libraries, transport interchanges, cafés and public offices is becoming more common. Hemet is a new take on 'WiFi' furniture which supports work modes enabled by wireless data services. It provides secure storage for bags in a large side locker and storage for coats in an under-seat drawer. It offers working facilities such as power, task lighting, a height-adjustable work surface and integrated side table. Hemet can be used individually, in a row against a wall or as back-to-back clusters.

- Generously-sized, height-adjustable and stable working surface. Deploys from the top of the side locker. Wide range of movement and can be positioned directly in front of the user. Reveals side table for drinks and file storage.
- Non-slip rubberised main work surface.
- Locker for bag storage and easy access to working equipment and integrating easily accessible power and cable storage.
- Under-seat drawer for coats and other items not regularly accessed during use, with silent closure action.
- Integrated low-energy lighting directly above the main work surface with intuitive switching and dimming. Folds away flush to the work surface.
- Available in different colours and with the option of independent seat and back colours.
- Easy levelling feet.
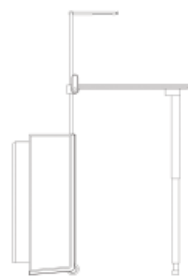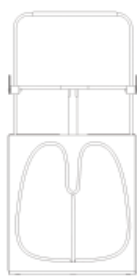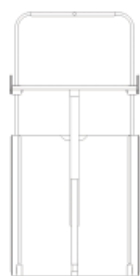
Brief: Provide integrated mobile working solutions, sensitive to older users' needs.

MOTORO Is a micro workstation and travel case that makes carrying and supporting working equipment easier.

Motoro helps ease the strain of working on the move. It is a strong and expandable carry case incorporating a height-adjustable work surface which can be used for comfortably working on a laptop or for writing. The case has low friction slide rails to help in lifting into trains and taxis. The main trolley extends and locks to prevent stooping while walking. An optional pen-sized table light which is usable as a detatchable torch helps working in low light situations and when looking for things in dark compartments. The body is engineered to be light-weight but is strong enough to carry several files and electronic equipment safely.

- Integral fold-out table with non-slip surface. Height adjustable from sitting to standing positions with low effort, quick release levers. Stable tripod configuration with low centre of gravity. Strong enough to be used as a stool. Surface can be angled for writing or reading.
- Light-weight rigid construction.
- Non-slip rubberised main work surface.
- Self lubricating and silent wheels.
- Standard size for inflight travel cases.
- Easy access side and top pockets. Large main compartment.
- Soft-grip, retractable trolley handle. Side handles for alternative carrying positions.
- Optional privacy screens and low-energy surface lighting that doubles as a torch.
- Protective slide rails for dragging and stowing.

Brief: To integrate body monitoring and preventative healthcare technology into work furniture. Introduce new health-centred elements into the workplace.

PRESENCE is a device for use with any task chair providing proactive healthcare information at work through simple user sensing abilities.

Presence uses an ultra-thin pressure sensitive seat cushion to detect user information such as time spent sitting or weight and degree of movement whilst seated. It encourages awareness of time spent in a fixed posture, sitting habits and other body position issues. Users are encouraged to develop a better cycle of work and rest that prevents the development of musculoskeletal problems.

The user can view information on a simple display on the seat back; historical and aggregated information can also be viewed. When seated, the display shows the sitter's name (useful for hotdesking) or other user-defined messages.

- Easy to fit to existing chairs.
- Simple two-button interface - display shows sitting time, weight, level of movement and user name. Angle adjustable with backlight for easy viewing.
- Comprehensive activity logging.
- Simple user advice system.
- Robust construction with low energy consumption.
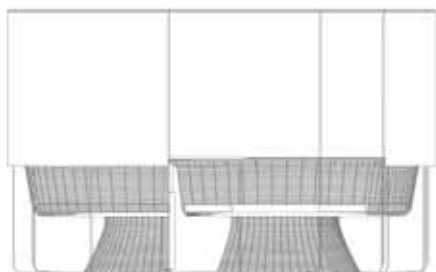
Create new kinds of compact amenities and facilities beyond the water cooler and the pot plant.

ASAS is a circular, modular seating system for adding a multi-functional amenity area to space-restricted workplaces.

Asas is designed as a cocoon into which people can retreat for a moment. It can be easily opened,closed and rotated to different extents, creating different forms and degrees of enclosure. Fully closed it can be used as a private meeting den or a resting area. Fully open it can be used as sociable booth seating. The central table is height adjustable to the level of the seat surface to provide a foot rest or small reclining area. It includes a light centred over the table with controllable up and down lighting atmospheres. The seating has a removable rail that holds and guides two layers of curtains, one fine and translucent, the other opaque and heavy. This helps to absorb background noise, alowing users to create their desired environment for a break.

- Compact footprint when closed.
- Lightweight and movable.
- Can provide different degrees of enclosure, for different situations – coffee break, lunch, reclining, informal seminars and so on.
- Integrated over table lighting with independent up-and-down LED sources, each with colour and brightness control.
- Two layer curtain system for visual and accoustic control.
- Under-table storage of cups, condiments and papers.
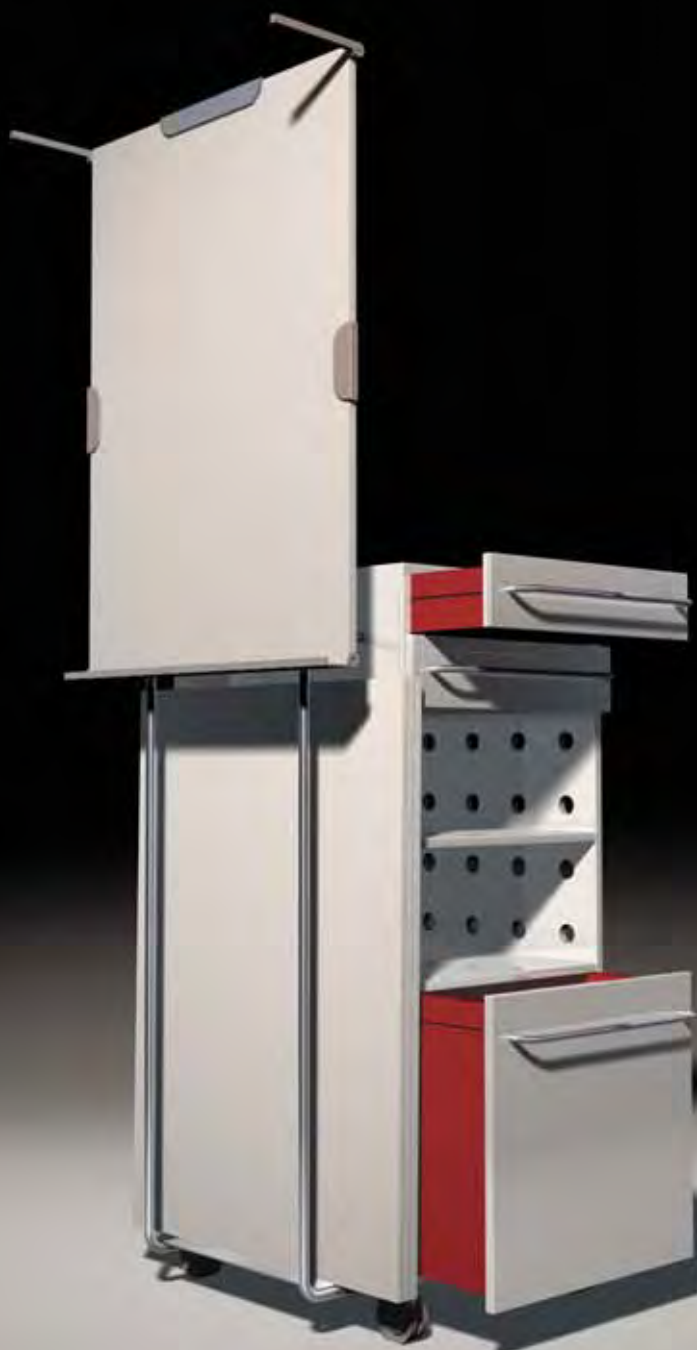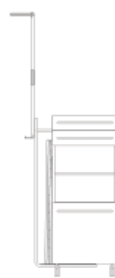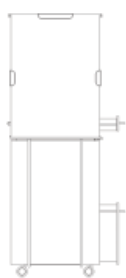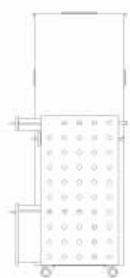
Brief: Incorporate knowledge-sharing technologies and affordances into the fabric of the workplace.

PLATO is a multi-functional concept for temporary learning and teamwork settings. It can be used as a presentation easel, lecture lectern, laptop holder or equipment trolley for presentations.

It is designed to be compact, mobile and fully adjustable to body size, mode of use and orientation. It has ample storage for projectors, props and stationery for group work settings. The easel is both height and angle adjustable with a magnetic white-board surface that allows for comfortable use by people of different body sizes and abilities. It incorporates low energy LED lighting to provide good contrast to either the easel or lectern surfaces in variable lighting conditions.

- Range of drawers with large easy-grip handles; smooth sliding action and anti-slam closure action.
- Height and angle-adjustable easel operated by low-effort locking handles either side. Easel can be stowed for transit.
- Magnetic easel surface with integrated fold-out pen or eraser storage.
- Pullout surface on top drawer to double usable working area.
- High brightness, dimmable and low energy easel lighting.
- Convenient and stable storage of up to 10 extra white-boards in tubular adjustable side clamp.
- Easy-access braking feature located at main surface height, not on the castor.
- Integrated cable management and stowing for laptops, projectors or video equipment.
- Can be adapted for left or right-handed users.
- Non-slip rubberised top surface.

Conclusion
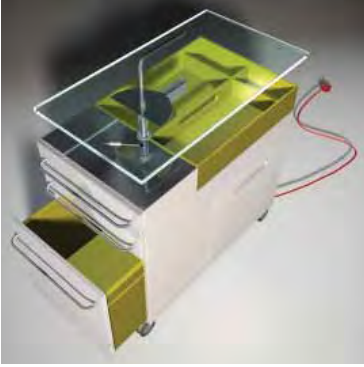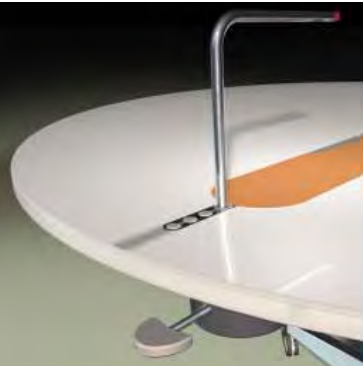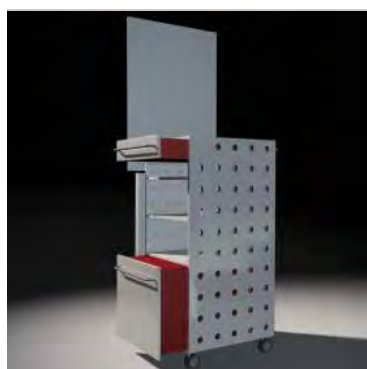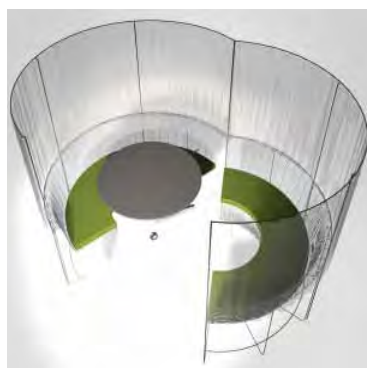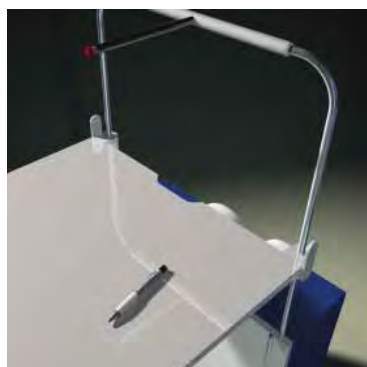
This report has introduced new ways of thinking about the design of more inclusive work furniture. It has done this by investigating the needs of older workers. The research identified nine key issues specifically affecting older workers and nine related opportunities for product innovation. The second part of the project delivered nine exemplar designs for different work furniture that demonstrate a response to these opportunities. Each design took a different typology of work furniture in relation to the older user, including: a meeting table, a screen, a stacking chair, a mobile workstation and a presentation system.

Insights

This research has shown that empathy with users and a willingness to learn from them can be a powerful driving force for design innovation. Many existing designs assessed as part of this research revealed inherent usability and performance problems as a result of favouring 'form over function'. In contrast, the process of inclusive design starts from performance-related issues, realistically assessed through direct user feedback, before moving onto form. However, this is not to suggest that aesthetic issues are any less important to discerning older users.

The research found that things do not necessarily change much as you get older, but some tasks do become more difficult and tolerance for ineffective environments does go down. On the other hand, for some people, change can be dramatic, particularly with the on-set of age-related health problems.

The Designs

The designs developed focus on a new language of elements offering performance benefits for older users. Solutions such as integrated lighting and easier-to-operate castor breaks are applicable across many different types of office furniture. The designs concentrate on usability issues such as the positioning and effectiveness of controls. They also examine adjustability to different users in different situations, such as: working in groups, working in public spaces and working on the move.

The designs are illustrated concepts that suggest approaches to the problems identified. The user-centered design methods adopted in this research will continue to be developed in conversation with the Kinnarps design team. It is hoped that physical prototyping and further user testing will yield results that have a direct and positive influence on future product lines.

The forces of demographic and social change that created the impetus for this project will increasingly influence the demands placed on where we work. For those interested in effective workplaces it is important to keep an eye on the future and demand better-designed work furniture for older users. If the furniture is better for older people, it is also better for everyone.

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