Nordic Welfare Centre

The future of working life

Technology and digitalisation for increased inclusion

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Background

A high employment rate is a cornerstone of the Nordic welfare model, as well as a crucial factor for national competitiveness. Everyone should have the opportunity to obtain gainful employment and enjoy a good working life. Compared to the population in general, people with disabilities have a lower employment rate and face greater challenges in working life.

The Nordic Council of Ministers' vision is that the Nordic region will become the most integrated, sustainable and competitive region in the world by 2030. This vision reflects the Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda for Sustainable Development. SDG 8.5 is to achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value. The right of people with disabilities to work is recognised in Article 27 of the United Nations Convention on the Rights of Persons with Disabilities. This includes the right to a work environment that is open, inclusive and accessible to persons with disabilities.

Present-day and future working lives are greatly affected by rapid technological development. Among the technologies that are becoming increasingly common are artificial intelligence and robots. New technological solutions present both opportunities and obstacles.

In 2019, the Labour Market Committee of the Nordic Committee of Senior Officials for Labour (ÄK-A) tasked the Nordic Welfare Centre with leading a project on the future labour market for people with disabilities. The aim of this project was to identify and disseminate knowledge of digital and technical solutions that increase opportunities for people with disabilities on the labour market and in working life. The mission included studying the need for research and innovation. The project has prepared three publications: a knowledge compilation on research and research needs; a toolbox for implementing digital and technical solutions; and a collection of examples of digital and technical solutions implemented in the Nordic region. This publication presents a summary of the knowledge compilation and toolbox.

New Technologies and Digital Solutions to Increase Inclusion in Working Life: A Knowledge Compilation has been prepared by Professor Jan Gulliksen of KTH Royal Institute of Technology in Stockholm and Stefan Johansson, PhD, and analyst Mia Larsdotter of Begripsam.

The Inclusive Workplace: A Toolbox has been prepared by Rudolph Brynn of consultancy Universell Utformning AS, and includes a chapter by Gunnar Michelsen on testing assistive technology in the workplace.

Digital and Technical Solutions: A Collection of Examples has been prepared by Lars Lindberg of the Nordic Welfare Centre.

The project has also arranged two webinars that can be viewed on the Nordic Welfare Centre's YouTube channel.

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Existing research into digital and technical solutions in working life

The authors of the knowledge compilation have investigated whether ongoing digital and technological developments have had any visible results in terms of increasing working opportunities for people with disabilities. The basis for this survey was a literature review limited to published research in peer-reviewed journals and conferences during the period 2010–2020. This was later supplemented with workshops, interviews and contacts with researchers and experts, as well as various reports issued by public authorities and other organisations.

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The most important conclusions are that:

- there is limited research and evaluation of digital and technical aids to working life and their impact on increasing access to working life for people with disabilities;
- the studies that do exist are either pilot studies or involve a limited number of subjects, restricting the possibility of drawing any more general conclusions, even if studies of small numbers of individuals may provide an indication of whether solutions can make an important contribution;
- the vast majority of research into technologies in the field of disability is based on a specific disability or activity, such as seeing or hearing, navigating one's surroundings, reading or writing, learning or understanding social communication, etc. This type of research proposes innovative technical solutions that can replace diminished function. It is also relatively common to find technological innovations for learning or training an ability, primarily cognitive or social abilities;
- the products developed are often based on an R&D project rather than basic research, often in the form of a feasibility study and proposals for new uses for a specific technology. Few of these R&D projects ever get to the stage of being implemented in working life;
- the practical experience of occupational therapists and other professionals working with workplace adaption does show that aids generally contribute to the ability of people with disabilities to perform their duties, but generally speaking these experiences are not systematically evaluated; and
- existing research is more likely to examine the rehabilitation of those injured in the workplace rather than how an unemployed person with disabilities might be brought into the workforce. This may be one contributing factor to why so many projects are dedicated to recreating or creating a function that an employer once had but has lost through injury or illness, rather than studying how technological developments can make the workplace accessible without the need for assistive technology.[1]

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What digital and technical solutions are available?

The knowledge compilation presents examples of technical and digital solutions with the potential to improve the labour market situation for people with disabilities. The authors see developments in a number of different areas of technology that clearly have potential applications in the workplace for people with disabilities. Generally speaking, these technologies are not being developed specifically for working life.

Artificial intelligence

The term artificial intelligence, commonly abbreviated AI, refers to technology that attempts to replicate the human mind in terms of intelligence and, especially, cognitive functions such as learning from experience, drawing generalised conclusions, planning, understanding natural language, problem-solving, etc. There are examples of AIs beginning to find their way into assistive technology. These aids are often presented in general terms and therefore not specifically linked to working life. Here, and in other products and services, AI is used to improve the performance and capacity of assistive technology such as a smart cane that can recognise objects and warn the visually impaired about obstacles in their path, or smart glasses that combine various technologies to recognise objects or faces.

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Apps

An application, or app, is a piece of software designed to carry out a particular task that can be downloaded to a computer, tablet or smartphone. Apps as assistive technology have become increasingly common, especially in the field of cognition. An app can transform a smartphone into an advanced aid. One challenge is the difficulty experienced by professionals such as occupational therapists in keeping up to date with the available apps on the market that might offer a solution to a given individual's problem. Many apps are short-lived and not updated. Another problem is the lack of user information, training and support. With a few exceptions, there are no systematic, regularly updated compilations of available apps to refer to. A further challenge is presented by the fact that apps are mainly in English and not always available in the Nordic languages.

Exoskeletons

Put simply, an exoskeleton can be described as a wearable artificial skeleton equipped with technology to increase the mobility, strength or endurance of the wearer. Depending on the technology employed, an exoskeleton may be soft or rigid. An exoskeleton can, for example, provide someone with diminished hand strength with a firmer grip. Today, however, exoskeletons are most commonly used to prevent work-related injuries rather than to make life easier for people who already have a disability.

Prosthesis control

A prosthesis is an artificial replacement for a lost or damaged body part. Technologies have been developed that allow the wearer to control a prosthesis, such as an artificial arm, with the mind. This field, which is called human/machine fusion, combines a number of technologies to compensate for lost bodily functions.

Augmented and virtual realities

Extended reality (XR), augmented reality (AR) and virtual reality (VR) are examples of technologies that, in various ways, mix reality with computer-generated perceptual elements via a digital interface. There are examples of research looking into the possibility of using such technologies to create more accessible manufacturing environments using solutions such motion sensors, motion recognition and the projection of instructions directly onto objects. Virtual reality can be used as a training tool, for example prior to a job interview, or for visiting different environments such as workplaces.

Haptic interfaces

Haptic interfaces allow the user to feel, touch and control virtual objects so that it feels like handling a physical object. One example of technology that has been developed is a haptic interface for reading Braille in the air.

Internal administrative systems

Internal administrative systems are used in almost all workplaces to keep the organisation running. While the most widely used office software packages for word processing and calculation generally have a high level of accessibility, internal administrative systems tend to have major flaws in accessibility. The trend towards storing functions and data in cloud-based solutions rather than locally on computers or physical servers offers opportunities for users with disabilities, such as storing user profiles or data in the cloud. This could potentially relieve them of the need to customise settings in individual services or applications. There are, however, legal obstacles such as data protection legislation that would need to be overcome.

Robots and robotics

Although robots have long been viewed as a future assistive technology, this potential has perhaps primarily been explored in the home and, more recently, in schools, or as an aid to taking part in cultural life. Robotics in assistive technology is often linked to the development of prostheses and wearable aids or with freestanding lifting or moving aids.

Collaboration technology

One technological field that has been the focus of considerable attention during the Covid-19 pandemic is digital systems for collaboration and co-creation. The most common use of this technology is for video meetings. Although this technology has been available for many years, the pandemic has given it a major boost. The solutions available on the market have suffered from accessibility issues, creating problems for many people with disabilities; however, video conferencing systems are developing rapidly as the pandemic dramatically increases their use. Functioning collaboration technology is a vital prerequisite for working from home, an opportunity long sought by people with disabilities.

Human language technology

Human language technology encompasses various solutions for analysing, understanding or generating human language, for example, by converting speech into text or automatically summarising content. This can be enormously helpful for groups such as people with hearing loss or dyslexia. Much of the development in this field is based on English. One common problem for the Nordic countries is that, form a global perspective, our languages are minor. There are however some examples of Nordic countries paying international software developers to produce versions in their national language.

Text-to-speech technology

There are a number of text-to-speech solutions available on the market. This is one example of how technology that was once reserved for specialist assistive technology is now an embedded function in many applications, websites and operating systems.

Speech-to-Text technology

Recent years have seen improvements in speech-to-text technology. Previous specialist software required relatively extensive efforts on the part of the user to train the software to understand their voice. Newer solutions use AI and are based on the analysis of large amounts of speech.

Wearable technology

Wearable technology is a relatively new field of research that involves wearing sensors close to the body. Examples include smart textiles and sensors that help deafblind people to communicate. The knowledge and examples compiled by the Nordic Welfare Centre include numerous examples of digital and technical solutions with the potential to increase inclusion in working life.

Important conclusions:

- today, virtually all jobs involve technical and digital solutions. This general development has been rapid and the demand for technical and digital competence has increased. While digital skills have improved in the population in general, including people with disabilities, this has not kept pace. In and of itself, digitisation is not enough to balance out the inequitable working situation of people with disabilities compared to the rest of the population.
- extensive technological development is underway with the potential to facilitate the working lives of people with disabilities; however, there is a lack of investment in research and development compared to a field such as welfare technology. It should be possible to apply solutions developed for other purposes, such as use in the home, to working life.
- Many solutions developed as prototypes are never commercialised due to the lack of funding or buyers. Assistive technology systems that offer a range of products are conservative and prevent new, innovative solutions from being brought in.
- There are no coherent programmes or initiatives underway in the Nordic countries to perform an overall analysis of how technology can contribute to increasing the inclusion of people with disabilities in working life.

Proposal

Some of the authors' most important proposals are:

- organised cooperation to identify the need for assistive technology, its development and long-term support so that new products can establish themselves on the market;
- one national stakeholder should obtain an overview of the solutions under development that can be transferred to a working-life context, as well as initiating and funding research;
- begin systematically collecting practical experiences from professionals and users of how digital and technical aids work and publish best practice;
- modernise assistive technology systems;
- increase opportunities to experiment with forms of work and organisation to assess how technology can support people with disabilities to be part of the workforce and develop in their jobs;
- improve statistics on the number and nature of available assistive technologies for the workplace and how these work; and
- cooperation at Nordic level should bring together the relatively few researchers, R&D projects, innovators, interest groups, etc. working in the Nordic countries, which are individually too small, as greater cooperation may lead to better use of resources.

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The Inclusive Workplace: A Toolbox

There are enormous societal benefits to the inclusive workplace: more people can enter the workforce, skills and abilities can be put to use and more people can work for longer, leading to a sustainable working life. This will help businesses to become more competitive and individuals to support themselves and self-actualise. Universal design is an important element of creating an inclusive working life. At workplaces characterised by universal design, the physical and psychosocial work environments interact with recruitment, skills provision and work organisation. Among other things, this is a matter of creating flexible work environments, benefiting from the diversity of the workforce and developing long-term, sustainable solutions. Universally designed workplaces are a prerequisite for more people to be able to use the products and services used in working life. The concept and demands of universal design are set out in a number of international documents and standards, the most important of which is the United Nations Convention on the Rights of Persons with Disabilities, which states that products, environments, programmes and services should, to the greatest possible extent, be accessible to all without the need for adaptation or special design. The European Union has issued a number of directives concerning working life, while each Nordic country has its own laws and regulations, such as work environment, discrimination and building legislation. A considerable responsibility for compliance and implementation rests with managers and supervisors in the workplace. Universal design in working life encompasses several factors: the physical work environment, digital tools and access to services and procedures related to the workplace. _The Inclusive Workplace: A Toolbox_ largely focuses on digital tools and information and communication technology.

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Barriers

People with disabilities will come across various barriers in working life. These include obstacles in the physical work environment, a lack of workplace adaption and negative attitudes from employers. One common problem is that systems used in working life, such as intranets and administrative software, are often inaccessible, meaning that people with disabilities may be less productive than colleagues. Another obstacle is presented when assistive technology such as screen readers are incompatible with software or cannot be connected to the equipment used in the workplace.

Tools

Important tools for an inclusive workplace:

- Digitisation and technology: While digitisation and technology can contribute to making working life more inclusive, this presupposes that the tools in question are accessible to and can be used by everyone and that there is adequate training and support for the individual employee.
- Public procurement: Including requirements for accessibility and universal design in tender documentation for goods and services reduces the need for special adaption. There are a number of national and international standards and guidelines that can be used in procurement processes. It is important to involve users throughout the process.
- Recruitment: A recruitment and appointment policy and action plan is a vital tool for achieving an inclusive workplace, as are recruitment systems and job interviews. Checklists can be useful to inventory flaws.
- Physical work environment: There are many different components to an accessible physical work environment, from the entrance to the workplace to ergonomics. Precise requirements differ depending on national legislation and regulation and international standards.
- Skills development: In an era when working life is changing more rapidly than ever, training and continuous professional development are essential for all employees. This is also a prerequisite for having the opportunity to pursue a career like others.
- Communication: Accessible internal and external communication should be based on the diversity of the workforce.
- Implementation of assistive technology: Assistive technology is an important tool and if it is to work it requires systematic work involving various competences, such as those using the aids. One important aspect is the interaction and interconnection of assistive technology with the information and communication technology used in working life.

The toolbox includes a great deal of advice and tips on each area regarding how to work strategically to achieve the goal of an inclusive workplace, as well as links to in-depth information.

Publications prepared in the project

Ny teknik och digitala lösningar för ökad inkludering i arbetslivet: En kunskapssammanställning [New Technologies and Digital Solutions to Increase Inclusion in Working Life: A Knowledge Compilation], Jan Gulliksen, Stefan Johansson and Mia Larsdotter
Den inkluderende arbeidsplassen - en verktøykasse [The Inclusive Workplace: A Toolbox], Rudolph Brynn and Gunnar Michelsen
Digitala och tekniska lösningar - en exempelsamling [Digital and Technical Solutions: A Collection of Examples], Lars Lindberg

About the publication

The future of working life – technology and digitalisation for increased inclusion