

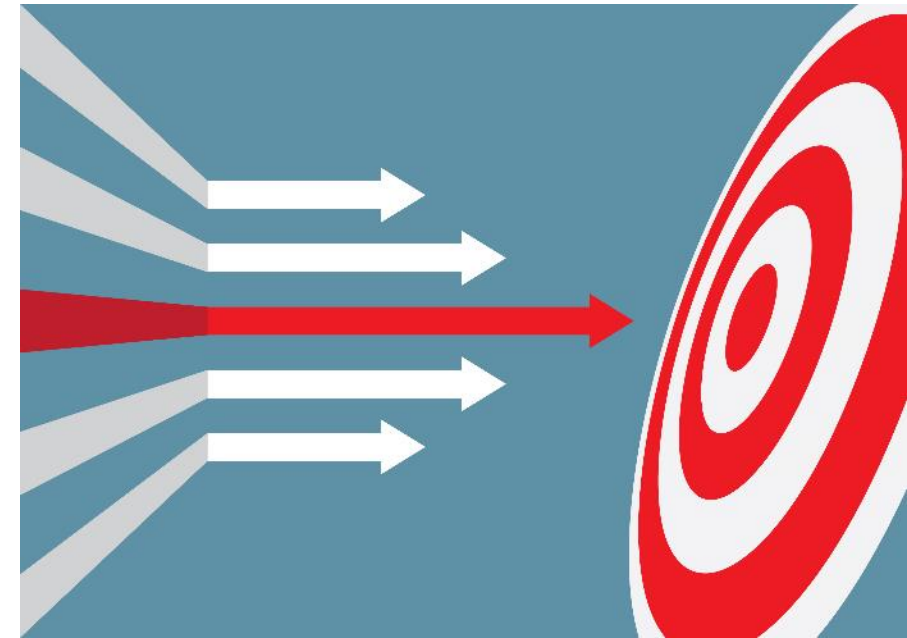
# The future of working in a virtual environment and OSH

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# Outline

- Virtual work environment
- Prevalence of work in a virtual environment pre and post Covid-19 pandemic
- Future projections
- Key considerations
- OSH opportunities
- OSH challenges
- OSH dilemmas
- Implications for policy, research and practice

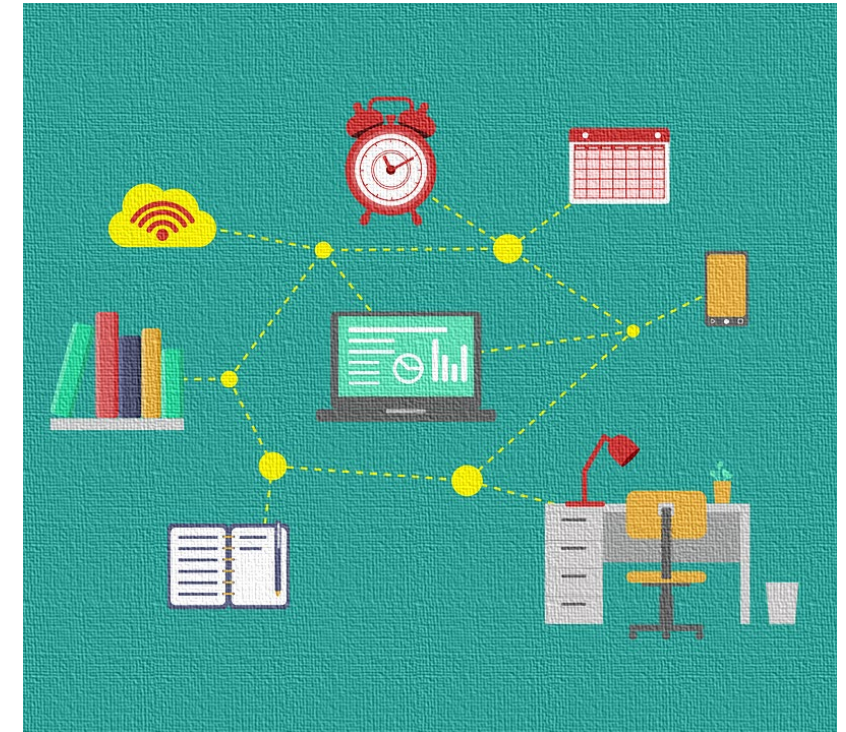


# Virtual work environment

- A virtual work environment or a virtual workplace is a workplace which exists digitally
- Can be exclusively virtual, having no physical presence, or a 'hybrid' with many work tasks and processes performed virtually
- Therefore, a virtual workplace can be conceived as a network of several workplaces technologically connected (via a private network or the Internet) without regard to geographic boundaries
- Covid-19 pandemic has accelerated the increase in virtual work environments with the trend projected to continue
- Role of virtual telework in preserving jobs and production in the context of the Covid-19 crisis highlighted by the European Commission in its recent communication on the 2020 country-specific recommendations (EC, 2020)

# Relevant aspects

- Telecommuting or Teleworking or Remote Work
- Online jobs, “e-worker (or e-nomad)”
- Hot desking
- ‘At-home’ jobs
- Virtual team/Distributed team/Dispersed virtual team
- Virtual reality (VR)
- Augmented reality (AR)
- Extended reality (XR)





# VR/AR use in the workplace



- Move towards use of VR/ AR in the workplace observed in ICT-intensive sectors as well as in engineering, manufacturing and healthcare
- A 2019 PwC report predicted that nearly 23.5 million jobs worldwide would be using AR and VR by 2030 for training, work meetings or to provide better customer service
- According to the same report, VR and AR have the potential to add 1.6 trillion to the global economy by 2030

# Prevalence of working in a virtual environment

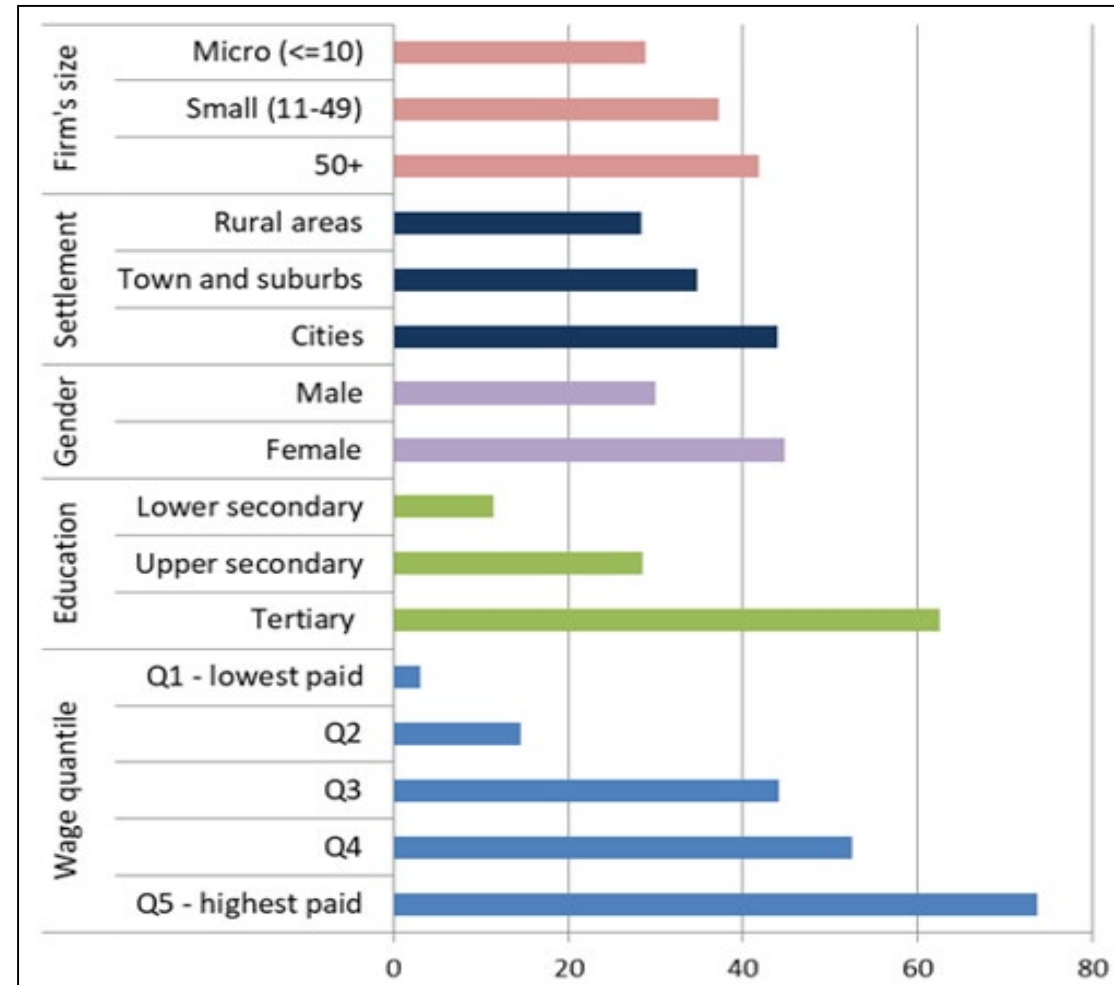
- In 2020, 12.3% of employed persons in the EU, aged 15-64, usually or sometimes worked remotely from home (Eurostat, 2021)
- Post-Covid-19 the proportion of Europeans working remotely virtually shot up to 40% (Eurostat, 2020)
- Unlikely to return to pre-pandemic levels: since lockdowns have eased, office capacity has been reduced by 30% to 50% in some cases (Horizon Magazine, 2020)
- Marked differences across countries (Nordic, Benelux vs Eastern, Southern), sectors (knowledge intensive vs manufacturing and others) and types of jobs (white collar, highly skilled, managerial vs others)



# Future projections

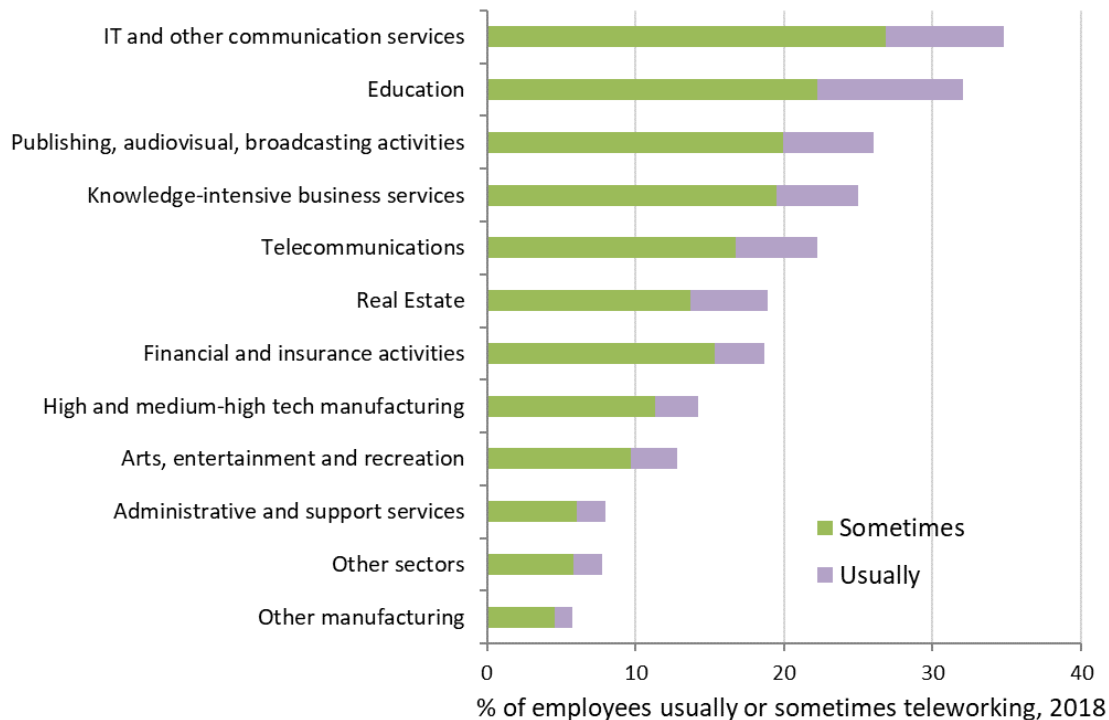
- Teleworkable employment in the EU has been estimated to range from 35% to 41% in two thirds of EU countries, with the highest value in Luxembourg (54%) and the lowest in Romania (27%) (Milasi, et al., 2020)
- Marked differences across:
  - countries: Nordic, Benelux vs Eastern, Southern
  - sectors: knowledge- and ICT-intensive sectors, education
  - types of jobs: 74% of workers in the top 20% highest paying jobs being able to telework, vs only 3% of workers in the 20% lowest paying jobs

**Employees in teleworkable occupations by workers' characteristics, EU-27 (%)**



# Considerations for employment sectors

## Prevalence of telework by sector, EU-27



- EU-OSHA (2018): largest potential rates of job losses in manufacturing, distributive trades, administration and support services - greatest potential for growth in professional, scientific and technical activities, information and communications, and repair of computers and household goods
- Eurofound (2020): nearly all financial-services employment is potentially virtually teleworkable (93%), 79% in information/communication, around two-thirds in real estate, professional, scientific and technical activities, education and public administration, 30% in health, 27% in retail, 16% in accommodation/food services, 10-20% in manufacturing and construction



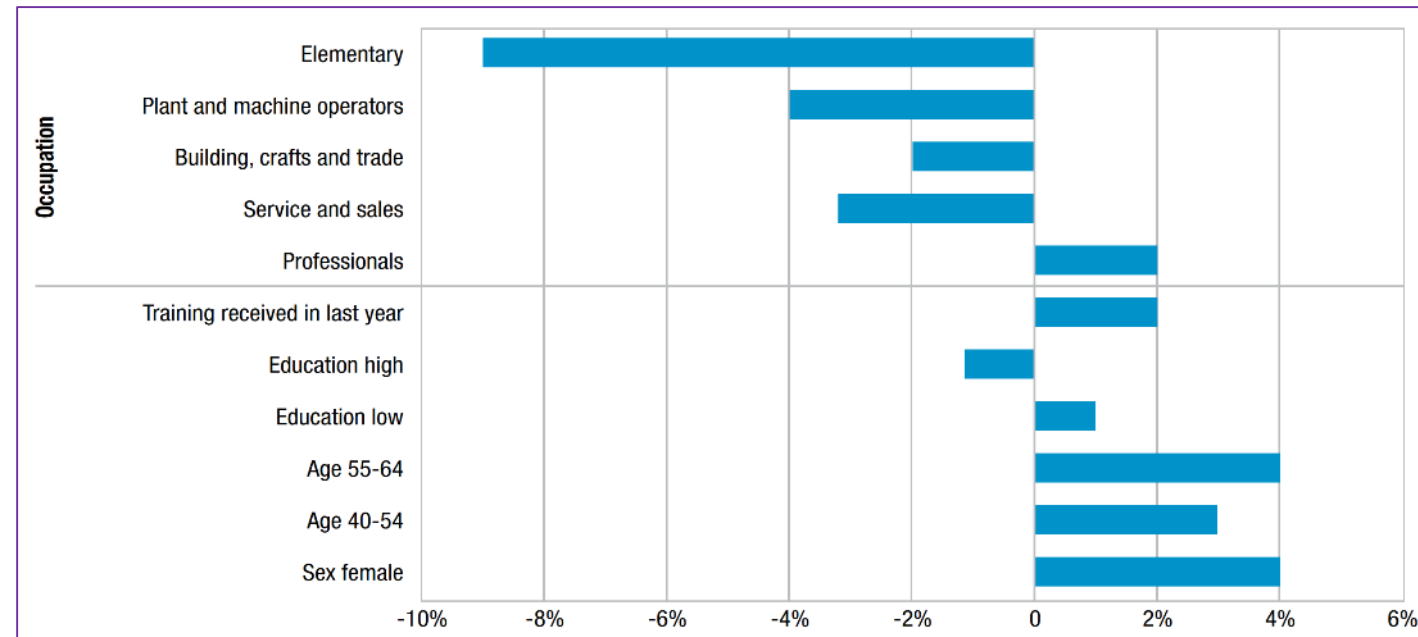
# Considerations for SMEs

- SMEs lag behind larger organisations in the use of technology in general as well as VR
- Larger companies are typically more likely to adopt virtual telework than smaller ones
- Barriers to adoption can include a lack of collateral to take risk and to access finance to invest in technologies and complementary assets, or a lack of key capabilities (OECD, 2019)
- Post-pandemic, the adoption of telework could be more difficult in countries and sectors where small firms account for larger shares of employment

# Other considerations

- Lack of experience with digital tools and remote working arrangements may limit uptake and effectiveness of virtual teleworking > one third of the EU labour force has very limited digital skills or none at all (Sostero, Milasi, Hurley, Fernández-Macías, & Bisello, 2020)
- Less than 25% of enterprises in the EU-27 provided ICT training to their staff in 2019, ranging from 37% in Finland to 6% in Romania (Milasi, et al., 2020)
- Cultural and organisational norms differ across countries in those countries > challenges in those countries with more traditional work arrangements and management systems
- VR/AR has potential to transform virtual work by dramatically changing and facilitating it > this will depend on the use of faster processors and 5G technology across urban/rural areas

Probability of digital skill gap, adult employees, 2014, EU-28 (Cedefop, 2018)





# OSH opportunities 1

- Virtual work and the use of VR can make work faster, more efficient and more cost-effective
- They can facilitate work from anywhere and connect individual workplaces > commuting and carbon emissions will be minimized contributing to more leisure time and a better work-life balance, as well as a greener environment
- Communication and collaboration processes can be improved (in the case of VR/AR utilising advanced sensory stimulation making the communication process much more realistic) and multidisciplinary work and teamwork strengthened
- They can make jobs more flexible and more accessible to a larger and more diverse pool of people, including older workers > this may result in longer working lives
- VR/AR can remove humans from hazardous environments, reducing for example physical risks, ergonomic risks, biological risks and exposure to dangerous substances

# OSH opportunities 2

- They can create safe, controlled and well-equipped testing and training environments > virtual prototyping will safely test (and develop faster) new products, methods and knowledge
- Use of smart devices can also provide preventative information to enable more effective monitoring of work processes and prevention by design > this can also be enabled by communicating and working with robots through VR interfaces and avatars
- AR can incorporate instructions, which could reduce human error
- It can also improve situational awareness by providing supplementary contextual information, for example on the presence of hidden hazards
- Rethinking risk assessment and management processes, using Big Data, smart devices, etc. and encouraging more active participation of workers in these processes (EU-OSHA, 2018)





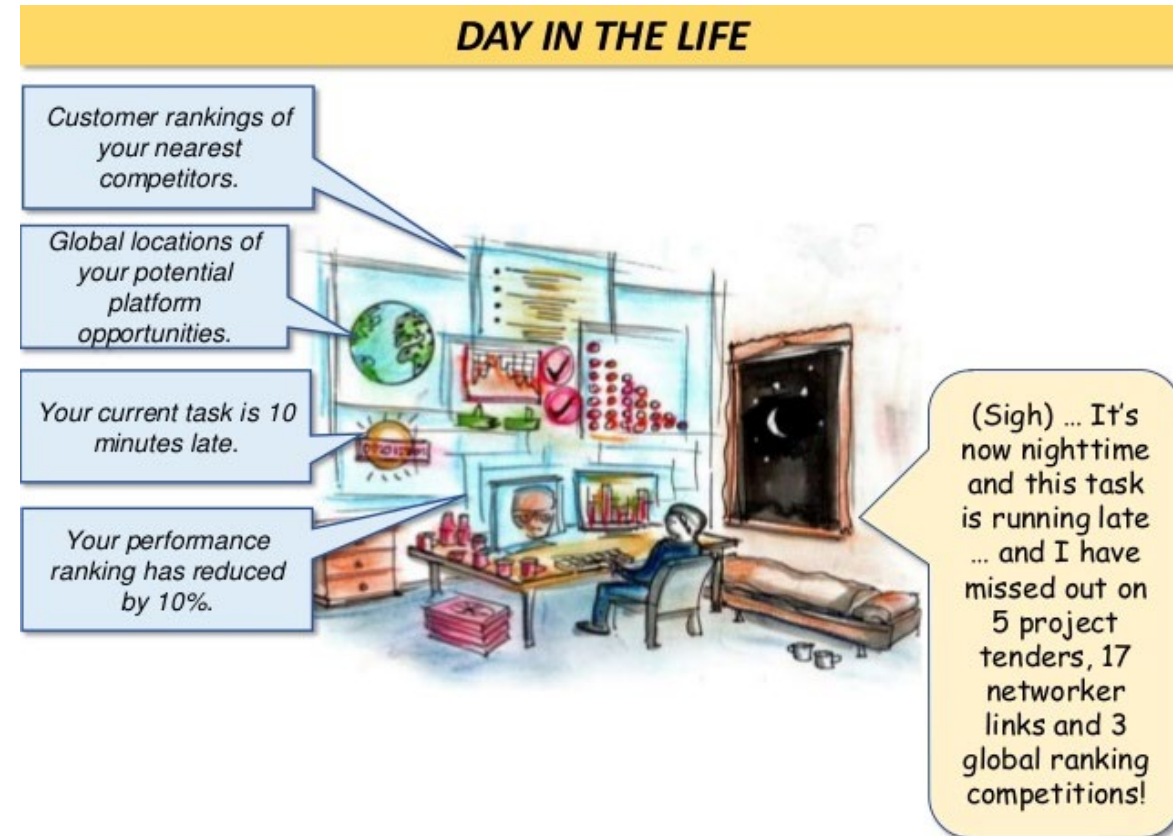
# OSH opportunities 3



- Digitalised management methods and VR can enable more accurate hiring of staff, data processing, distribution of work, performance monitoring and appraisals as well as tracking wellness aspects
- This has the potential of facilitating less hierarchical, more participative management practices and could lead to new collective bargaining models
- It can also support the development of healthy workplaces > VR/AR in particular can help with worker relaxation through immersing them into a relaxing VR environment

# OSH challenges 1

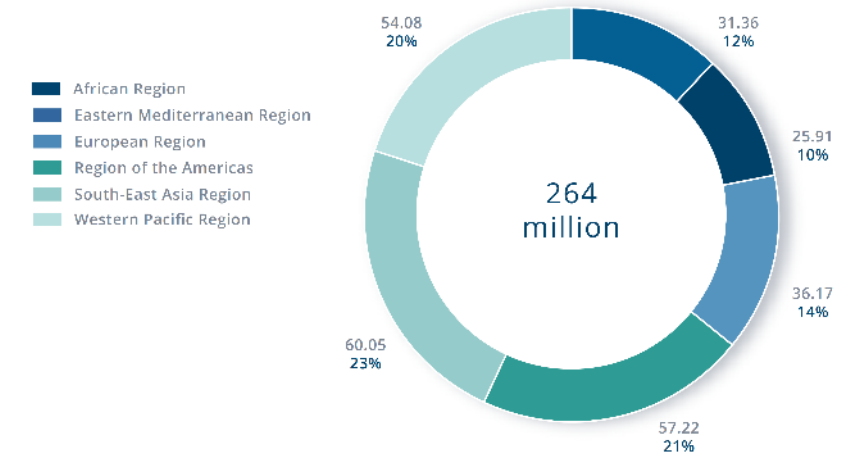
- Changes in technology will bring about frequent changes in work processes, job insecurity will increase and there will be more frequent job changes
- With the ability to work virtually from anywhere, and many workers doing so from home, the boundaries between work and private life may become blurred
- Workers may work longer hours and have difficulty to disengage from work, feeling physically and emotionally exhausted, especially where there is lack of experience of virtual work and lack of support
- Many workers will exhibit online addiction (wanting to always be on)
- The use of performance-enhancing drugs might increase, especially in the case of addiction, longer working hours and strict performance monitoring based on digital algorithms



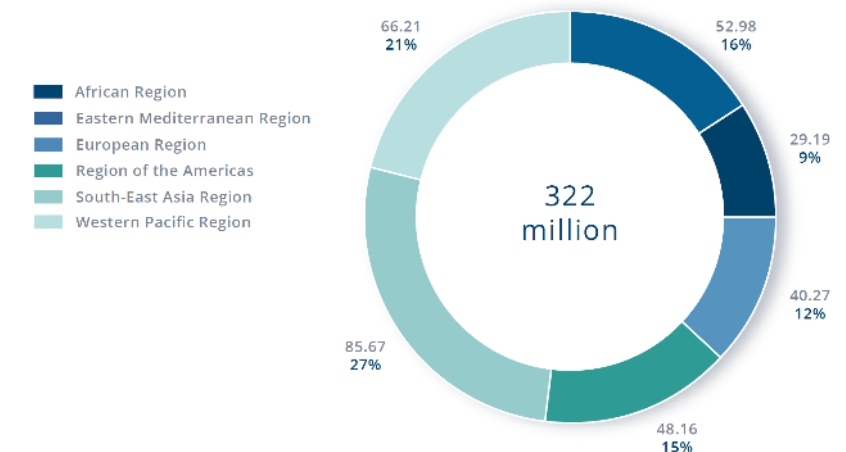
# OSH challenges 2

- Psychosocial risks and work-related stress will increase since the pace of work will be faster and employees might have less control over their work, especially if this is machine dictated
- Remote virtual work from home may increase feelings of isolation and loneliness - Lack of social interaction and support might emerge as challenges despite technological advancements supporting better communication
- More diverse workforce participation might make communication more challenging while cyberbullying may increase in virtual work, especially since more workers will work in virtual teams
- These issues will result in a rise in mental ill health problems such as anxiety and depression

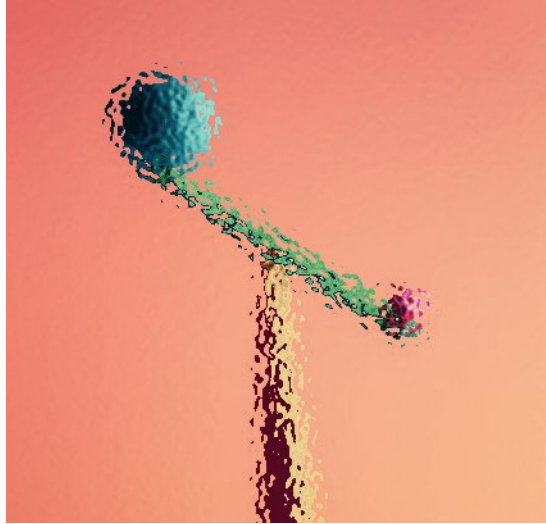
**Cases of anxiety disorder (millions),  
by WHO Region**



**Cases of depressive disorder (millions),  
by WHO Region**



# OSH challenges 3



- Female workers might face additional burden without appropriate support since they might have to juggle remote virtual work from home with additional care responsibilities
- Working from home has implications in terms of suitability of work stations, equipment and connectivity and could pose ergonomic risks, leading to MSD problems
- Sedentary work is common in virtual work and can lead to obesity, heart disease, diabetes and MSD problems. Increased virtual work and use of 5G technology will also mean more exposure to electromagnetic fields (EU-OSHA, 2018)



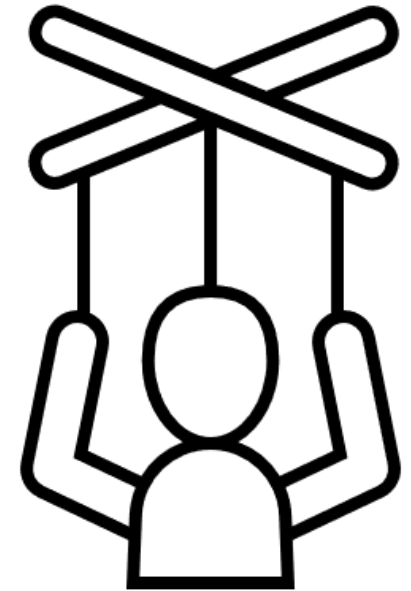
# OSH challenges 4



- Use of new smart equipment and devices, especially VR, can result in eye strain, repetitive strain injury, increased cognitive load and decreased situational awareness
- Loss of awareness of users' actual surroundings during and even for some time after their use, physical disorientation and motion sickness > accidents (EU-OSHA, 2018)
- Cybersickness > nausea and dizziness is expected to become more prevalent with the increased use of VR headsets
- Other rarer issues associated with VR include increased photosensitive seizure risk and epilepsy
- If interacting with robots through VR interfaces and avatars > more cognitive load and technostress, especially if the robot controls the pace of work and outpaces the worker

## OSH challenges 5

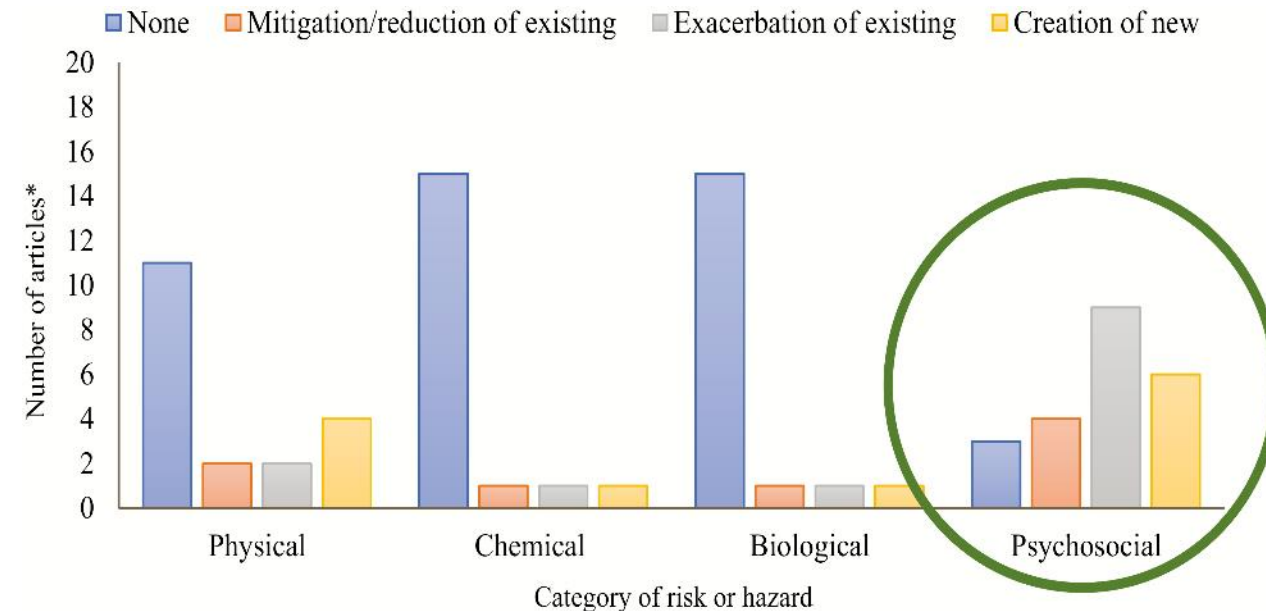
- Faster data processing, algorithmic management and audible command technologies means that the pace of work will become faster and workers might have less control and autonomy over their work
- Algorithmic management of work and workers, AI, monitoring technologies, such as wearables, together with the Internet of Things and Big Data may lead to cyber-security (which is also related to the use of social media) and data protection issues, ethical issues, and information inequality with regard to OSH (EU-OSHA, 2018; Moore, 2019)



# OSH challenges 6

- Virtual working may lead to an increase in atypical work and non-standard employment and increasing numbers of workers treated as self-employed independent workers, falling outside existing OSH regulation and social protection provisions (OECD, 2019)
- As a result, there can be job insecurity and frequent job changes among the workforce
- More investment in VR will bring about new highly specialized jobs > this will imply a need for upskilling and reskilling of the workforce

**Frequency of job risks and hazards anticipated for the future of work in the peer-reviewed literature.**



\* Categories of *mitigation/reduction*, *exacerbation*, and *creation* are not mutually exclusive. Totals sum to more than 17 in each risk/hazard category.

Source: Schulte et al., 2020 - *Ann Work Expo Health*, Volume 64, Issue 8, October 2020, Pages 786–816, <https://doi.org/10.1093/annweh/wxaa051>

# OSH dilemmas

<b>Responsibility</b>	How to define employer and worker responsibility in relation to risk management while working in new virtual work contexts and conditions (e.g. remote virtual work; virtual work from home; working in a VR environment). How can social protection be ensured even for independent workers?
<b>Policy</b>	How to achieve a good balance between regulation and other types of policy in order to address new and emerging risks in virtual work while not hindering rapid progress. How can inspections be more agile?
<b>Autonomy and control</b>	How to balance flexibility through virtual work with worker autonomy and control over their work. How can worker participation and collective bargaining be supported?
<b>Privacy</b>	How to protect worker privacy in a virtual environment while using algorithmic monitoring and surveillance. How can ethical hiring, appraisal and evaluation processes be developed maintaining human dignity?
<b>Technology interface</b>	How to incorporate new technological interfaces (e.g. enhanced sensory stimulation, robotics) in virtual work processes while ensuring human sensitive and human-in-control design. How can SME infrastructure and worker skills be developed appropriately?
<b>Productivity</b>	How to balance organisational economic performance against social performance. How can health, safety and well-being be addressed in a preventative way in the context of virtual work? How can an economy of well-being perspective be promoted and adopted?
<b>Workforce diversity</b>	How to support more participation of diverse groups (e.g. female, older, younger, different ability, migrant, low educated workers) in virtual work while developing their skills and providing appropriate support. How can a lifelong perspective to the development of the workforce be promoted?

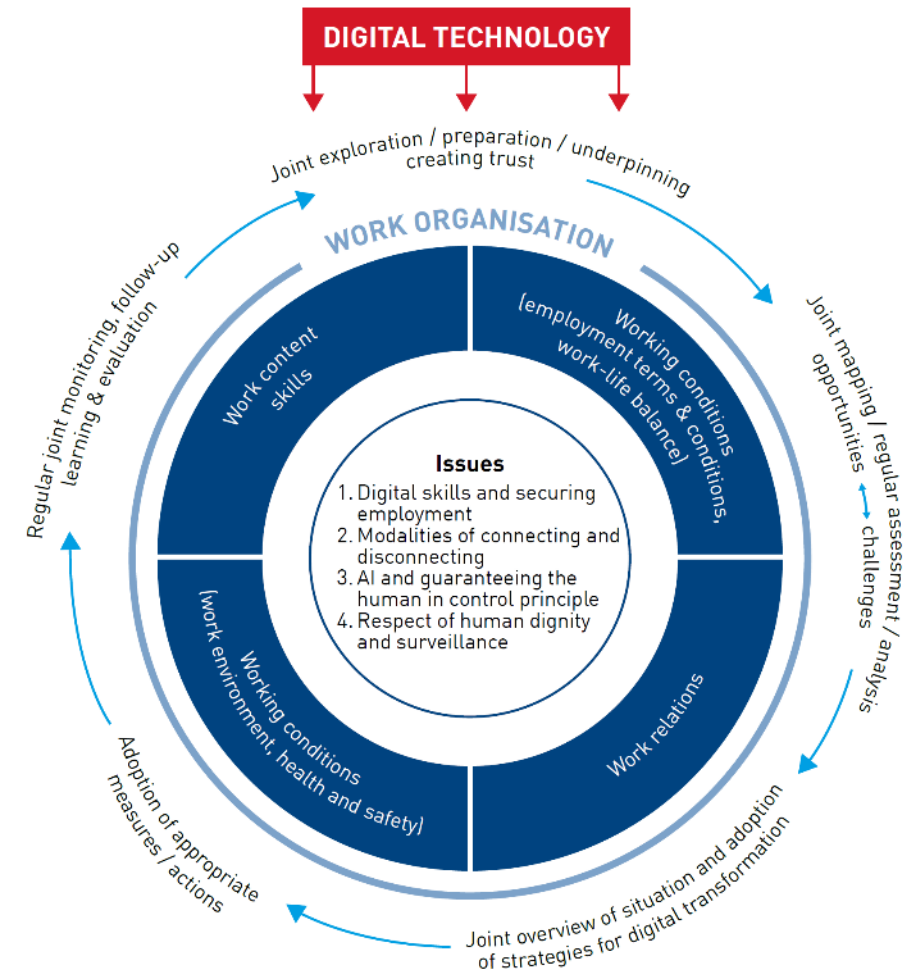


# Implications for policy 1

- Need for the policy framework to be re-examined in light of new and emerging risks and a good balance to be found between hard and soft law
- Existing regulation would need to be updated regularly to cover and address new and emerging risks and ethical issues
- The regulatory framework should clarify OSH liabilities and responsibilities in relation to new systems and new ways of working (ILO, 2019)
- Standards and voluntary social partner agreements can play an important role > A good example is the recent framework agreement on digitalisation (2020)
- Sectoral approaches would hold great potential

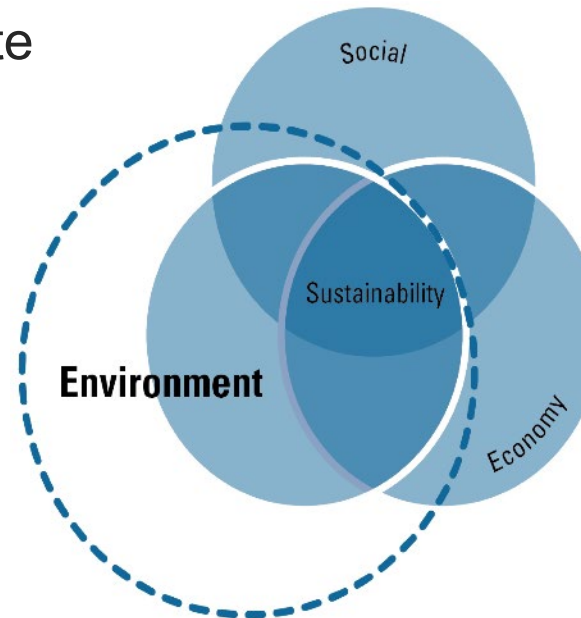
EUROPEAN SOCIAL PARTNERS (2020) AUTONOMOUS FRAMEWORK AGREEMENT ON DIGITALISATION

## DIGITALISATION PARTNERSHIP PROCESS



# Implications for policy 2

- Holistic policy models would need to be developed adopting a lifelong perspective to working life with a strong wellbeing focus
- Policy efforts should aim to minimise the EU country divide in terms of digital skills and virtual work and should be accompanied by appropriate support and infrastructure development programmes > should continue to place a great focus on micro enterprises and SMEs
- Inspection can be improved using Big Data and smart devices (EU-OSHA, 2018)
- ICT-ETs can facilitate the development of new, more direct collective bargaining structures (OECD, 2019)
- Provision of effective OSH services to virtual workers through the use of new technology



Source: Adapted from Occupational Safety and Health Administration (OSHA) (2016). Sustainability in the workplace: A new approach for advancing worker safety and health. Washington, D.C.: U.S. Occupational Safety and Health Administration.

# Implications for research

- Research infrastructure needs to be enhanced through EU research funding mechanisms including Horizon Europe
- OSH observatory and forecasting capabilities should also be strengthened utilising new technologies so that relevant data to be generated fast
- Collaboration between researchers, professional associations, industry, social partners and governments in research and innovation in developments of ICT-ETs technologies should take into account human aspects and adopt a strong 'prevention through design' approach (EU-OSHA, 2018)
- Research should address new and emerging risks, e.g. risks associated with VR/AR as well as psychosocial risks in virtual work
- A strong focus on wellbeing and adopting and supporting a lifelong perspective to working lives should be prioritised
- Research should also address emerging ethical issues and strongly consider ethical dimensions of data generation and management

# Implications for practice

- Developments in ICT-ETs create opportunities to rethink risk assessment and management processes, using Big Data, smart devices, etc. (EU-OSHA, 2018)
- Need to coordinate approaches to develop ethical practical practices > aforementioned partnerships and collaboration among stakeholders are important
- OSH training is a key area that will be transformed through the use of VR/AR
- Practitioner and worker skills will need to be updated accordingly in relation to working in a virtual environment
- Professional associations have important role in developing ethical codes of practice for their members
- International and national standards can be defined to promote good practices in working in a virtual environment

## Top 10 skills of 2025

### Type of skill

- Problem-solving
- Self-management
- Working with people
- Technology use and development

-  Analytical thinking and innovation
-  Active learning and learning strategies
-  Complex problem-solving
-  Critical thinking and analysis
-  Creativity, originality and initiative
-  Leadership and social influence
-  Technology use, monitoring and control
-  Technology design and programming
-  Resilience, stress tolerance and flexibility
-  Reasoning, problem-solving and ideation

Source: Future of Jobs Report 2020, World Economic Forum.



***Thank you!***

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