Tech2Heal Preparatory Project

State of the Art Review

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Contents

1. Introduction

It is noted that Northern Periphery Artic (NPA) countries, i.e., Ireland and Finland, are challenged with improving the healthcare provision, e.g. occupational support or counselling, and enhancing the well-being, e.g., physical and mental, of the working populations. It is a fact that unplanned/undesirable absence impacts companies in Europe. Its observed consequences might be disrupting production cycles and material losses for employees and employers., which have made this matter meaningful for European policymaking (Antczak & Miszczyńska, 2021).

There have been noted several causes for absenteeism in Europe, among them is dealing increasingly with chronic health conditions and inappropriate support systems to remain working. It is also noted that one cause of early retirement is poor health. Tech2Heal aims and objectives regarding researching the state of the art and feasibility for this project are:

1.1 Aim and Objectives

- Identify the main problems in the working environment related to absenteeism and early retirement of certain professionals in the NPA countries.
- Poll stakeholders' interest to gain awareness regarding their life-work situation
- Identify cases where technologies have been used to monitor the well-being of professionals in their working settings in order to design preventive or reactive healthcare models.

1.2 Research questions

- What are the main causes and consequences of work absenteeism in the Northern Periphery and Artic Area? Are there any causes in common?
- Is there interest of specific stakeholder groups to gain awareness or improve their work/life balance situation?
- Can technologies help to monitor the main causes of work absenteeism owed to poor health?

2. Background and Related Work

2.1 Causes and consequences of work absenteeism in Ireland

In April 2023, owed to the application and analysis of the results of a survey related to health and wellbeing promotion in over 1500 Irish companies by researchers at University College Cork (UCC), it was noted that Irish employers are increasing their concerns regarding the mental health of their employees since their absenteeism has increased in the last 12 months and it is impacting adversely performance. Now, 18% of Irish companies experience employee absenteeism owed to mental health reasons. This quantity increases as the size of the company increases. For example, a company with 50+ employees can expect 40% of employees to report mental health problems. Most companies are not investing enough in support for employees' mental health, i.e. One in five companies have a dedicated budget for mental health. Smaller companies are less probable to provide support for employees regarding mental health and well-being, owing to resource constraints, informal practices, and the lack of a distinct HR function (Daly, 2023, April 6; Bourke, Roper, & Lenihan, 2023).

Before the COVID-19 pandemic, 7% of companies in Ireland had employees working remotely, while now, this has increased to 32% of companies (Daly, 2023, April 6; Bourke, Roper, & Lenihan, 2023). Most of the employers see remote/hybrid working positively. In addition, presenteeism in Ireland, which is working when ill, is higher in Ireland (27%) when compared to the UK (21%). The lowest proportion of companies showing presenteeism are based in the West and border regions of Ireland (25%-23%). Its main reasons are a need to meet deadlines, client demands, shortage of staff, employers needing extra hours/money, company culture, pressure from managers or other colleagues, or job insecurity.

Bourke, Roper, & Lenihan (2023) observed that the mental health supports, and well-being activities conducted by companies depend on the sector: (1) 32% of all the companies interviewed have a health and well-being lead at the board/senior level, (2) 29% have in-house mental-health support and signposting of services, (3) 23% have a mental health plan, (4) 22% use data to monitor employee health and wellbeing, (5) 20% has a budget for mental health initiatives, and (6) 10% employ mental health champions. This is worst in companies at the border with Northern Ireland. For example, companies with a mental health plan are about 17%, 18% use data to monitor the wellbeing of employees, and 8% have a budget for mental health initiatives.

On average Irish companies report 2.8 sick days in average per year per employee. Absenteeism is perceived to impact business operations and performance by 46.4% of the companies interviewed by Bourke, Roper, & Lenihan (2023). The consequences experienced are staff shortages, lower productivity, and pressure on the remaining staff to meet deadlines. Absent people are perceived as showing a lack of interest in work, they do not have a good relationship with colleagues, they do not complete tasks and get done very little work.

Work-life balance has been recognised as one of the elements comprising a healthy work environment since it prevents burnout and reduces anxiety/stress. It is defined as time to undertake personal tasks and activities (leisure time). However, remote workers usually work more hours than people working on-site. From all the companies interviewed by Bourke, Roper, & Lenihan (2023), 60% of companies reported encouraging maintaining a healthy level of work-life balance. Strategies used to encourage this are (1) encouraging employees to not answer emails outside working hours, (2) role modelling behaviour from managers, (3) using companywide communications (from HR), (4) tracking methods of hours worked, (5) regular informal conversations from line manager, and (5) regular formal conversations from line manager.

It was observed that 1.8 million days were lost in 2011 linked to illness and work-related injuries in Ireland (Russell, Maitre & Watson, 2015). Also, 47 people lost their lives at work between 2004 and 2013. It is noted that it is important to understand occupational injury and ill health to target interventions and have a preventive approach towards them.

From 2001 to 2012, it was observed that the most common types of work-related illness among Irish were musculoskeletal problems (just over half of the people enquired) and stress, anxiety and depression (18% of the people enquired). This analysis was conducted using data from the Central Statistics Office (CSO) based on employers' reports (Russell, Maitre & Watson, 2015). It was observed that the highest rates of injury were found in the sectors: (1) agriculture/forestry/fishing, (2) industry, (3) construction, (4) transportation/storage, and (5) human health and social work activities.

According to the report by Russell, Maitre & Watson (2015) factors associated with the risk of work-related injury and illness are:

1. The individual characteristics of workers: (a) Men are significantly more likely to experience work-related injuries than women, which holds even under different working conditions such as the number of hours and sector; (b) The odds of injury decrease with age, e.g. older workers have greater job experience, less involved in manual tasks, and they are lower risk-taking; (c) non-Irish workers are less likely to experience work-related injuries or greater reluctance of the immigrants to report injuries; and (d) regarding health problems work-related illness increase with age.
2. Sectoral influences: (a) Work-related injuries are higher in the sectors: construction, farming/forestry/fishing, health and social care workers, and industry; (b) the highest risk of occupational ill-health is in agriculture, construction, transport, and health sectors and the highest risk of illness is in the transport sector owed to extremely demanding work arrangement such as long hours and shift work.
3. Job characteristics: (a) Long hours (fatigue and concentration) are associated with ill health and injury; (b) Highly variable working hours are associated with higher illness and injury risks; (c) Long hours and variable hours are commonly found in self-employed; (d) self-employed are over-represented in the group of fatal injuries or illness; (e) injury and illness mostly happen on people working shifts or at night; (f) workers with little experience, with tenures of less than six months were four times more likely to experience a workplace injury in contrast with workers with tenures of over five years.
4. Work-related fatalities: The highest fatalities rate occurred in the agriculture, forestry, and fishing sectors, followed by the construction and industry sectors.

2.2 Causes and consequences of work absenteeism in Finland

Vuorio et al. (2019) have examined the factors influencing sickness-based absence and its outcomes among municipal employees in Finland. The study utilizes data from a large-scale survey conducted among Finnish municipal employees to investigate the predictors and consequences of sickness absence. The study found that poor self-rated health, chronic illnesses, and mental health problems were significant predictors of sickness absence among Finnish municipal employees. Employees with pre-existing health conditions were more likely to take sick leave compared to those without health issues. Furthermore, high job demands, low job control, and lack of social support at work were associated with increased sickness absence rates among municipal employees. Stressful work environments and job dissatisfaction were identified as important contributors to absenteeism. In addition, certain sociodemographic characteristics, such as older age, female gender, and lower educational attainment, were found to be associated with higher rates of sickness absence. These factors may influence an individual's susceptibility to illness and their ability to cope with work-related stressors. The study also explored the outcomes of sickness absence, including its impact on workability, job satisfaction, and organizational commitment. Employees who experienced frequent sickness absences reported lower levels of work ability and job satisfaction, as well as a reduced commitment to their organization.

Based on a recent article from the Finnish Institute of Occupational Health (FIOH 2023), sickness absences in Finland saw a notable increase in 2022. It suggests that various factors may be contributing to this trend, including the ageing workforce and the challenges associated with mental health issues. Additionally, the article mentions that the COVID-19 pandemic might also have played a role in exacerbating absenteeism rates. The article highlights that this rise is particularly sharp among

healthcare professionals. The lowest rates of absences due to own illness were among managers, senior specialists, finance secretaries and publicists. Overall, the article underscores the importance of addressing these trends and implementing strategies to manage and mitigate sickness absences in the workplace.

A study by the Finnish Centre for Pensions (FCP 2020) insights into the prevalence of mental disorders as the primary reason for retirement on a disability pension in Finland. According to it, mental health issues have become increasingly prevalent as a cause for retirement over the past decade, affecting individuals across various age groups and genders. This trend highlights the growing significance of mental health in the workforce and the need for effective strategies to address and manage these conditions. The importance of proactive measures and support systems in the workplace and prioritizing mental health initiatives to promote overall well-being and productivity among employees is emphasized.

2.3 Feasibility of using Digitalization to prevent work absenteeism and early retirement

According to Lappalainen et al. (2022), the utilization of new digital assessment methods in workplaces has the potential to significantly contribute to the prevention of work absenteeism and the development of disabilities by enhancing workplace health and safety measures. These methods provide comprehensive insights into workplace conditions, enabling the early identification of potential health risks and facilitating timely interventions to mitigate them. Through personalized approaches tailored to each workplace's specific needs, digital assessments allow for targeted interventions aimed at reducing work-related injuries and illnesses. Moreover, digital platforms facilitate improved collaboration and communication among employers, employees, and occupational health professionals, streamlining the process of identifying and addressing health and safety concerns. Despite challenges related to technology access, these methods promote accessibility and equity in workplace health initiatives, ensuring all employees can contribute to efforts aimed at preventing absenteeism and disabilities.

Furthermore, in 2018, the Finnish Centre for Pensions tested a machine-learning algorithm that used a self-learning statistical technique to predict whether an individual would retire on a disability pension within two years. The algorithm was created based on the data of 500,000 individuals. At the end of the process, the algorithm predicted correctly 78 percent of cases when an individual would retire on a disability pension. The data consisted of socioeconomic, earnings, and benefit information.45 The extensive and centralized registers offer a good platform for the use of machine learning to identify risks. Since this experiment, the pension fund Varma has developed a forecast model that will help employers identify potential cases of disability risk. This machine learning uses data on socio-demographic information as well as information on rehabilitation and benefits (Väänänen 2019).

On the other hand, digitalization also brings challenges in preventing early retirement. Yashiro et al. (2020) present empirical evidence showing a link between exposure to digital technologies and early retirement pathways, such as access to unemployment benefits for older workers in Finland. It finds that older individuals in occupations more exposed to digital technologies are more likely to exit the labour market when they gain access to early retirement pathways compared to those less exposed to technological change. Access to unemployment benefits amplifies this effect, particularly for those facing higher risks of automation. The study underscores the need for policies that pair preparations for the future of work, like lifelong learning opportunities, with labour market reforms that remove

disincentives for older workers to continue working. Additionally, it calls for targeted measures to enhance the employability of specific worker groups, particularly those at higher risk of automation.

In Maltseva (2020), it was noted that organisations are introducing wearable devices (Fitbit, Garmin, Apple, etc.) to improve performance, but also to attain an enhanced managed lifestyle. These are used because the feedback is aimed to help managers and employees and enhance the engagement of employees (corporate wellness programs) with their work and work environment. Some examples of these wearables are in Table 1 by Maltseva (2020). These can be used to attain enhanced awareness of the work environment, reduce risks, and provide individual feedback performance measures. This is because they are unobtrusive, allow ubiquitous recording, are personal, and unnoticeable, which allows them to blend with everyday life.

Table 1. Types of wearable devices and the data they collect

Anatomy	Device type	Environment data	Performance data	
			Raw data	Application format
Head	Glasses	Blind spots	Eye movements	Fatigue/Concentration
	Augmented reality glasses	Integration of digital worlds with reality (layering)	Body movements, eye movements, facial expressions	Emotions, mental states, physical condition
Wrist	Wristbands	Air temperature, humidity, pressure, GPS, sound/noise, light	Body movements	Physical condition (overall health, analysis of endurance), energy expenditure (calories), group dynamics (geographical proximity between employees), productivity (speed of movements)
			Body temperature	Physical condition (overall health), emotions (arousal)
			Blood oxygen saturation, blood pressure	Physical condition (analysis of endurance)
			Heart-rate variability/blood volume pulse	Emotions (valence and arousal) Productivity
			Electrodermal activity	Emotions (arousal)
Chest	Bra	n/a	Circadian metabolic changes in heat	Cancer prevention
Fingernail	Patch	Ultraviolet rays	No data collected	No data collected
Feet	Soles	GPS	Body movements	Physical condition (overall health, analysis of endurance), energy expenditures (calories)

Table 1. Wearables in the Workplace by Maltseva (2020) p. 495

However, wearables might be detrimental to organizational performance when ethical issues are not addressed. For example: The data provided by wearables has limitations since does not reveal a causal relationship between different processes, since there is a lack of context. Wearables do not have access to social and psycho-structural foundations of affective responses or interpersonal interactions, i.e., wearables can indicate that the emotions happened, but not the reasons. It is noted the biggest challenge from managers' perspective in organisations is making sense of their employees' analytics (Maltseva, 2020). Also, if the data is not reflecting accurately employees' performance (incongruity), wearables are perceived as detrimental to productivity. It is also important that insights are not used against employees, since if managers know that some employees are more resilient to stress or better at committing to healthier lifestyles, they can experience favouritism, causing legal issues, discrimination, and dehumanisation of the work environment. Also, it is important to point out that employees' data should be secured and that the employees' rights are appropriately taken into account (Hornung & Kamal, 2023, April 27). For example, regulating access rights (asking for informed consent),

implementing technical and organisational measures, and respecting the principle of data minimisation (storage limitation and specific deletion periods).

2.4 Results of the Stakeholder Surveys

2.4.1 Stakeholder survey in Ireland

It was observed that healthcare workers in Ireland are one of the groups with the highest risk of work-related illness. The Atlantic Technological University (ATU), Donegal campus includes the Faculty of Science and Health and the Department of Nursing and Health Studies. To ensure the quality of nursing education, ATU is in continuous contact with the Health Service Executive (HSE), so it holds regular meetings with the Donegal Local Joint Working Group (LJWG). We took the opportunity of the meeting held on 29/09/2023 to poll the interest of the HSE in being part of the Teh2Heal project. To this meeting attended:

In the Room:

- Dr. Louise McBride, Head of Dep of Nursing & Healthcare (HOD)
- Ms Breda Mulgrew, Programme Lead, General Nursing, ATU Donegal (BM)
- Mr Jonathan Durning, Programme Lead, Mental Health Nursing, ATU Donegal (JD)
- Sobin Babu (SB)
- Ms Christina Cuffe, Clerical Officer ATU
- Dr. Karla Muñoz Esquivel, Assistant Lecturer in Computing

In MS Teams:

- Dr. Anne Drake, Director of Nursing, Letterkenny University Hospital (AD)
- Dr. John McCardle, Acting Director Donegal Mental Health Services (JMC)
- Ms Una Gallagher, Director of Nursing for Intellectual Disability Services (UG)
- Roisin McLaughlin (RML) Director CNME - Regional Centre of Nursing & Midwifery Education
- Thomas Murray (TM) Director SLMHS (Mental Health Services in Sligo/Leitrim & West Cavan)
- Ann Lister (AL) Gillian Whyte (GW) HSE
- Dr. John McCardle, Acting Director Donegal Mental Health Services (JMC)

The questions were made to participants in the room using the Mentimeter (2024) website and the results are:

- HSE will be willing to invest in programs that seek to keep people 40+ in good physical and mental health (3 people highly agree and 4 people agree).
- HSE agree (4 people) and highly agree (5 people) that employers should fund in conjunction with HSE programs in pro of the wellbeing of employees.
- Regarding the design of the programs, the HSE highly agrees (2) and agrees (4) regarding the involvement of employers in creating these programs, while 2 people neither agree nor disagree.
- HSE agrees (4 people) and highly agrees (3 people) that insurance companies should also fund these wellbeing programs.
- The opinion was more fragmented regarding whether employees should get used to monitoring and reflecting on their health and hours spent working, physical activity, and stress

levels, where 2 people highly agree, 1 person agree, 2 neither agree or disagree, and 1 person disagree. This can be observed in Figure 1.

- Regarding whether employers should reflect periodically on employees' work commitments (workloads), physical health and mental wellbeing. The results showed that 4 people highly agree, 1 agree, and 2 neither agree nor disagree.

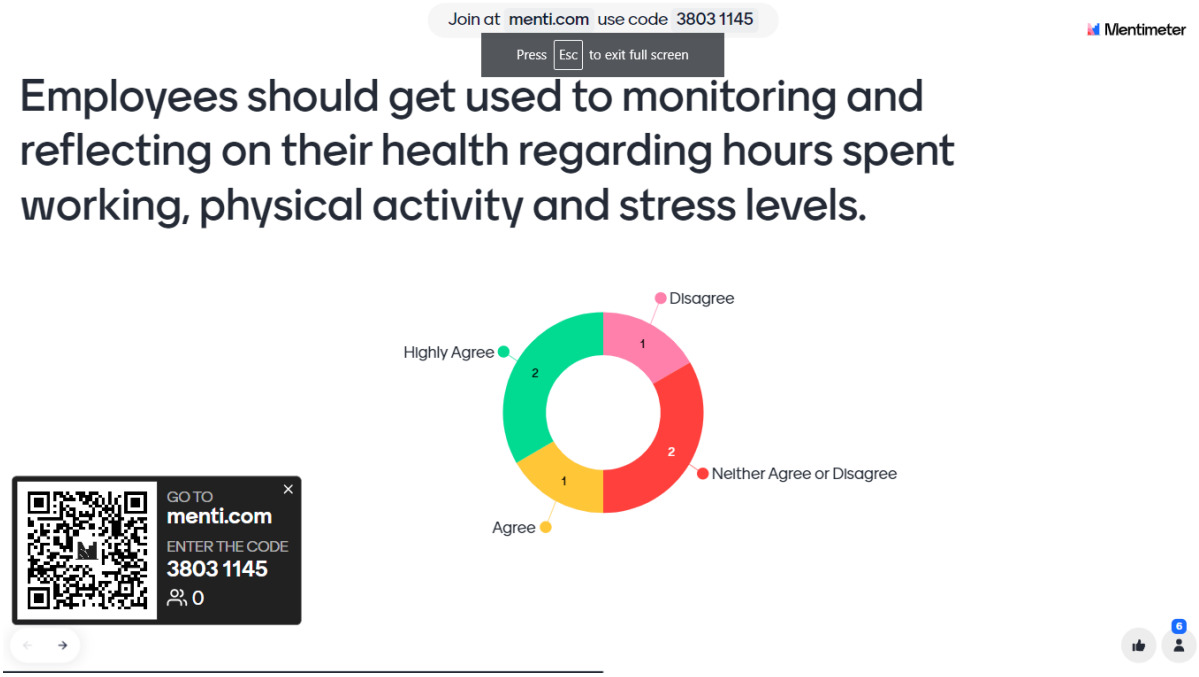

Figure1. Answers by HSE and healthcare staff members regarding employees reflecting on their life-work balance.

In addition, the HSE members expressed that the HSE would like to be part of Tech2Heal's main project as an employer.

2.4.2 Survey on readiness & attitudes for technology-assisted preventive occupational healthcare in Finland

The survey on readiness and attitudes for technology-assisted preventive occupational healthcare gathered insights from a diverse group, including employers, employees, and occupational healthcare service or technology providers (N=21). The survey results are found as appendix. The key findings of the survey are summarizes as follows:

Familiarity and Effectiveness Perception: Nearly half of the respondents (47.6%) reported being not familiar at all with technology-assisted preventive methods for addressing work absenteeism and early retirement. Majority of the respondents considered current preventive healthcare measures very (19.0%) or somewhat (52.4%) effective.

Importance of Future Technology-Assisted Methods: Most participants (65.0%) deemed future technology-assisted preventive methods as very important in addressing work absenteeism and early retirement.

Current Usage of Technology-Assisted Methods: Mobile applications (83.3%) and health monitoring using devices like smartwatches (66.7%) were among the commonly used technology-assisted methods.

Primary Challenges Faced: According to employers and occupational healthcare service/technology providers, limited access to resources and information (46.2%) and lack of awareness among employees (53.8%) were identified as primary challenges for providing effective preventive occupational healthcare services.

Necessary Support for Implementation: The employers and occupational healthcare service or technology providers highlighted training and education for staff (69.2%) and collaborative partnerships with technology providers (61.5%) as crucial resources for effective implementation.

Factors Influencing Adoption: According to employers and occupational healthcare service/technology providers, cost-efficiency (83.3%) and ease of integration with existing systems (66.7%) were key factors influencing the decision to adopt new technology-assisted preventive methods.

Employers' Perspective: Evidence supporting the effectiveness of the technology (100.0%) was the most influential factor for employers considering investment in technology-assisted preventive methods. A majority of respondents expressed openness to collaborate with technology and research partners (66.7%) to develop innovative solutions for preventive occupational healthcare.

Employee Comfort and Preferences: Wearable technologies for health monitoring and virtual consultations via telehealth services were generally favored by employees, with a notable comfort level (57.2%) in allowing employers to collect health data through technology-assisted methods for preventive healthcare purposes.

Concerns and Reservations: Data privacy and security (70.0%) and reliability/accuracy of data (60.0%) were primary concerns regarding integrating wearable technology and sensors into occupational healthcare services.

In conclusion, while there is significant recognition of the importance and potential benefits of technology-assisted preventive methods in occupational healthcare, there are also notable challenges and concerns that need to be addressed, particularly regarding data privacy, reliability, and employee acceptance. Collaboration between stakeholders and access to adequate resources are key for successful implementation.

3. Discussion

From the review conducted, it was observed that specific sectors are at higher risk of work-related illness or death. E.g. agriculture, forestry, fishing, farming, health and social care work. Also, that work conditions and employees' experience might be key to predicting physical or mental health outcomes in the long term. For example, self-employed people might experience long working hours, varied working hours, and night shifts. In addition, after the COVID-19 pandemic now is more common for people to work from home, which brings benefits to employees, such as avoiding long commuting times. However, this makes it more difficult to define the line between working time and leisure time and attaining a life-work balance. Also, the COVID-19 pandemic put considerable stress on healthcare workers, so after the pandemic, the number of reports regarding illness and absenteeism increased in this cohort. In addition, it was observed that according to the type of industry and the size of the companies, it is less or more likely that companies are interested in supporting employees' wellbeing, have a budget or dedicated staff/program to keep an eye on the mental well-being of their employees. It should be noted that also employers find it difficult to balance workloads, define working shifts, and measure performance among employees.

It was also observed that technologies, such as wearables, have the potential and have been used previously to enhance the workplace environment. It can help employers gain insight into the actual work-life conditions they are offering and therefore regarding the appropriateness of the workloads. In addition, some technology can help employees gain capabilities to do their work or reduce the risk of injury. Also, some wearables offer a better follow-up of chronic diseases. However, it was also observed that ethical considerations and General Data Protection Regulations (GDPR) should be taken into account to not create a toxic work environment and ensure data security. As a result, we decided to focus Teh2Heal main project on the monitoring of work-life balance and working conditions to attain an enhanced understanding of the reasons behind absenteeism and early retirement. The ultimate goals will be to implement pilots to validate the solutions; to help employees and self-employees gain awareness and reflect on their daily habits and challenges; and to propose changes to work/health policies. Furthermore, the pilots of Tech2heal will aim to include stakeholders of the sectors that are at the highest risk of work-related illness.

4. Conclusion

It was observed that absenteeism related to illness brings several consequences to organisations, such as not meeting deadlines, putting the staff under pressure, and money loss. Also, it was observed that the majority of the illness-related cases are linked to musculoskeletal problems or anxiety/depression. In addition, some sectors are at higher risk of work-related illness than others. Working conditions and work-life balance are key to predicting work-related illness. Ubiquitous technologies, such as wearables, have shown that can provide enhanced awareness to employers regarding working conditions and work-life balance. The NPA main project Tech2heal will monitor both in order to attain an enhanced understanding of the causes behind absenteeism to help people to gain awareness regarding daily habits and suggest changes in work/health policy.

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