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Musculoskeletal disorders and digital well-being - a Czech probe

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Muskuloskeletální poruchy a digitální pohoda - sonda z česka

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Abstract

Occupational health and safety (OSH) concern all developed economies. Digital transformation and innovations cause as a side effect of working environment musculoskeletal disorders (MSDs). They have become a long-time work-related health problem and remain the most common occupational disease in the EU. Gender, age, and lifestyle influence differences in musculoskeletal disorders' prevalence and occupational consequences, lower productivity, sick leaves, and early retirement. The most prevalent symptoms of MSDs are in the lower back, neck, and shoulder regions, wrist pains, and eye syndrome. The paper aims at health and safety at work with an accent on MSDs and risk prevention. The methodology uses a combination of on-the-desk analysis of papers from the Web of Science and two narrative cases about the situation in the Czech Republic – one about OSH in micro and small enterprises and the second one about the digital well-being of higher education lecturers. Public administration encourages MSDs prevention on the national level through campaigns and education programs. Employers can develop MSD prevention that can include various provisions; the minimum consists of complying with the OSH legislation, monitoring risk factors at workplaces, using protective equipment, and offering stretch training exercises.

Keywords: musculoskeletal disorders; small enterprises; high education lecturers

Abstrakt

Všechny rozvinuté ekonomiky se zabývají bezpečností a ochranou zdraví při práci (BOZP). Digitální transformace a inovace jsou příčinou muskuloskeletálních poruch (MSD), a to jako vedlejší efekt pracovních podmínek. Staly se tak dlouhodobým zdravotním problémem, který souvisí s prací, a v EU představují nejběžnější profesní onemocnění. Gender, věk a životní styl ovlivňují rozdíly v prevalenci muskuloskeletálních poruch a negativně dopadají na výkon profese, vedou k nižší produktivitě, pracovní neschopnosti a odchodům do předčasného důchodu. Jejich nejčastější příznaky jsou v oblasti beder, krku a ramen, způsobují bolesti zápěstí a oční syndrom. Cílem příspěvku je BOZP se zaměřením na MSD a prevenci rizik. Metoda jeho zpracování kombinuje výsledky výzkumů publikovaných v databázi Web of Science se dvěma případovými studiemi v ČR, a to o přístupu k prevenci rizika MSD v mikro a malých podnicích

a o digitální pohodě učitelů na vysokých školách. Instituce na národní úrovni podporují prevenci MSD prostřednictvím kampaní a vzdělávacích programů. Zaměstnavatelé mohou přispívat k prevenci muskuloskeletálních poruch, která zahrne různá opatření; minimálně jde o dodržování zákonných předpisů o BOZP, dále o monitorování faktorů rizik na pracovištích, používání ochranných prostředků a nabídku strečových tréninků.

Klíčová slova: muskuloskeletální poruchy; malé podniky; učitelé na vysokých školách

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Introduction

Musculoskeletal disorders (MSDs) and digital well-being are interconnected because excessive or improper use of digital devices can contribute to physical and mental health issues. The paper aims at MSDs and risk prevention. The analysis deals with the conditions in micro and small enterprises and public universities in the Czech Republic. Regarding the universities, the focus is on higher education (HE) lecturers and their digital well-being. These sectors differ in their roles in the economy and society, employment, human resource management (HRM), and the quality of work life; however, approaches to digital well-being show similar characteristics in both segments and remain on the edge of organization prevention.

The research questions for which the paper is looking are the following:

- What approaches to digital well-being at home work exist?
- What practices are used to prevent MSDs in micro and small enterprises?
- What is the digital well-being of HE lecturers at Czech universities?
- What policy and practice can prevent MSDs at universities?

1. Theoretical part

1.1 Musculoskeletal disorders and digital well-being

In today's world, self-employment or employment in micro- and small enterprises is becoming increasingly important. ILO estimates that these so-called "small economic units" play a far more critical role in providing jobs than previously believed. Micro-enterprises are defined as having up to nine employees, and small enterprises with up to 49 employees. Data collected for the International Labor Organization report in 99 countries found that they stand for 70 % of total employment (ILO, 2019). In the EU, small and micro enterprises employ more than 50 % of the workers. Moreover, they are responsible for more than 50 % of the European occupational safety and health (OSH) situation (Zwetsloot et al., 2017). The significant proportion of employment appeals that public administration is under pressure to master the issues with the quality of working life in micro- and small enterprises, mainly focusing on the lower wages, poor working conditions, hazardous occupational safety, and health provisions, the lack of social protection and industrial relations.

Health and safety at work indicate a long-term concern on both global and local levels. In 2008, the European Agency for Safety and Health at Work (EU-OSHA) reported that musculoskeletal disorders (MSDs) were the most common work-related health problem in Europe and remain the most common occupational disease in the European Union (EU). Work-related MSDs account for over 40 % of safety hazards (Wee et al., 2018). They become one of the most important causes of absenteeism, increased costs, and human injuries, which are very common among computer users (Navidi et al., 2021). In the EU, workers in all sectors and occupations can be affected. The EU-OSHA supports national activities and organizes campaigns in 2020-2022 for improving OSH pieces of training and MSDs prevention. It leads to ergonomic interventions designed for office and computer work.

Secondary sources provide a bulk of evidence of factors that causes MSDs. Analyzes focus on identifying differences determined by gender, age, smoking, and body mass index. They show the influence of sectors, workplace ergonomics, and job requirements with the economic consequences and productivity, incl. impacts on healthcare systems and the quality of employees' life. Repetition of specific postures and movements and lower physical activities lead to muscle loss, which generates pains, decreases workers' range of joint motions, reduces proprioception sensory function, and reduces posture maintenance (Park & Lee, 2020). A specific awareness gradually gives sedentary work as a characteristic of the current working conditions. Adults working in full-time sedentary jobs spend 75 % of their time sitting. Their sedentary behavior increases the prevalence of sedentary time habits, resulting in 9-11 hours of total daily sitting time (Bhore et al., 2019). Some occupations adapted a sedentary behavior, and employees use it in working and leisure. They stay long hours in one position, which leads to excessive load on the lumbar spine, and back, poor endurance of muscles, muscle imbalance, and lower extremity disorders. Bhore et al. (2019) argue that it includes weakening the body's central musculature, i.e., weakening the body's central musculature and increasing the risk of musculoskeletal disorders. However, sedentary behaviors are causes of other severe adverse impacts on the human body. They bring about increased all-cause mortality, cardiovascular disease mortality, cancer risk, and risks of metabolic disorders such as diabetes mellitus, hypertension, and dyslipidemia. As mentioned above, the impacts of wrong body postures lead to musculoskeletal disorders such as arthralgia and osteoporosis, but to depression and cognitive impairment (Park et al., 2020).

Epidemiological studies consistently confirm gender, age, and lifestyle differences in musculoskeletal disorders' prevalence and occupational consequences. Back, neck, and shoulder regions seem to become prevalent when considering gender and age differences (Collins & O'Sullivan, 2010; Ryan, 2010). These factors, job requirements, and work organization have been implicated as potentially risky, among which psychosocial risk factors and the pathology of disorders play a decisive role. Job descriptions characterize the working conditions containing the exposure to ergonomic risks, like painful/tiring postures, lifting/moving heavy materials, standing/walking, repetitive hand/arm movements, and hand/arm vibration (Park et al., 2018). Stubborn work postures are a good predictor for the prevalence of work-related musculoskeletal disorders. Females are seen as more susceptible to MSDs than males, and older workers are more vulnerable than younger workers. The most prevalent symptoms of MSDs are in the lower back, neck, and shoulder regions, wrist pains, and eye syndrome, which are classified as part of musculoskeletal disorders. A general trend is evident for increasing prevalence with age. Females with MSDs had a moderately increased risk of chronicity compared to men when including MSDs with a traumatic background. Possible explanations argue that lower incomes, a higher proportion of diagnostic subgroups with poor prognosis and a younger age of chronicity among women can cause the prevalence of their MSDs and signal trends (Gjesdal et al., 2011).

Health and safety at work are long-term concerns on both global and local levels. Organizational interventions are heavily marketed to prevent MSDs and improve the comfort, safety, and productivity of office workers with symptoms of MSDs (Leyshon et al., 2010). For example, ergonomic interventions designed for office and computer work have become widely available. However, office work entails a high level of computerization with multiple risk factors (including ergonomic and psychosocial) affecting worker health and well-being. Lima and Coelho (2018) argue that their analysis did unveil statistically significant associations between exposure to psychosocial job factors and

ergonomic risk factors. Another example regarding the toxic conditions can illustrate work with visual display units because employees are more likely to complain about MSDs and ask for an appropriate design of workstations to reduce the MSDs prevalence among them. (Ricco et al., 2016).

Based on the findings mentioned above, MSDs emerge due to working conditions that affect the musculoskeletal system's muscles, bones, tendons, ligaments, and other components. When discussing MSDs and digital well-being, the concern is how excessive or improper use of digital devices can contribute to or exacerbate these physical health issues. However, digital well-being is a multidimensional concept that acknowledges the benefits and challenges of increasingly connected digital lives (Charles et al., 2022). So, it refers to the overall state of an individual's physical and mental health in the context of their digital device usage and online activities. Moreover, it encompasses various aspects of one's health and social well-being. It emphasizes the need for conscious and responsible use of technology to support physical and mental health and foster a positive and balanced relationship with the digital world. Individuals, families, educators, and technology companies play a role in promoting digital well-being through education, awareness, and the development of user-friendly digital tools and settings. Finding a reasonable balance between MSDs and digital well-being requires considering when to design a prevention program several points:

- Posture and ergonomics. Prolonged use of digital devices like smartphones, tablets, and laptops often involves poor posture, such as slouching or hunching over screens. Practicing good ergonomics, such as ergonomic chairs and desks, can help mitigate these issues.
- Repetitive strain injury (RSI). Overusing digital devices, mainly through excessive typing or clicking, can lead to RSI. Typical forms of RSI include carpal tunnel syndrome and tendinitis. Frequent breaks and ergonomic keyboard/mouse setups can reduce the risk.
- Blue light exposure. Digital screens emit blue light, disrupting sleep patterns and contributing to eye strain. Poor sleep can negatively impact overall well-being. Reducing screen time before bedtime and using blue light filters on devices can help.
- Sedentary lifestyle. Excessive screen time often correlates with a sedentary lifestyle, contributing to various health issues, including obesity and cardiovascular problems. Maintaining a balanced approach to screen time and incorporating regular physical activity into daily routines is crucial for digital well-being.
- Mental health. Constant connectivity and exposure to social media can contribute to mental health issues such as anxiety and depression. Striking a balance between online and offline life, setting boundaries for screen time, and practicing digital detox can help maintain good mental health.
- Digital addiction. Excessive use of digital devices and online platforms can lead to addiction-like behaviors. It can negatively impact overall well-being, relationships, and productivity. Recognizing the signs of digital addiction and seeking professional help when needed is essential.

In summary, to maintain a healthy balance, individuals should be mindful of their digital habits, practice good ergonomics, and take regular breaks to address and prevent potential MSDs and other well-being concerns related to digital technology use.

1.2 Digital well-being at universities

University workers use computers daily and tend to suffer from MSDs. However, reports about working conditions and MSDs prevention at universities, mainly from higher education lecturers, are scarcy, which illustrates the number of papers published in the Web of Science Core Collection and Scopus in the last 20 years in Table 1 and Table 2**.** Collins and O'Sullivan (2015) analyze data on the self-reported prevalence of MSD symptoms and psychosocial risk exposures by age and gender among a group of sedentary workers at a university who use their computers for at least 25 % of their workday. Their findings show that neck, shoulder, and back musculoskeletal disorders were higher for females than males, yet age differences within genders were not evident for these symptoms. During the COVID pandemic, university staff were massively forced to use the home office and experienced both positive and negative

impacts on their health; however, their teleworking scheme paid minimum attention to workspace ergonomics and postures, increasing health risks (Black & St-Onge, 2022).

QUERY	WEB OF SCIENCE CORE COLLECTION[1]	SCOPUS[1]
“Musculoskeletal disorders”	22,384	14,369
“Musculoskeletal disorders” and “micro enterprises”	1	1
“Musculoskeletal disorders” and “small enterprises”	4	4
“Musculoskeletal disorders” and “university”	3,453	739
“Musculoskeletal disorders” and “higher education institutions”	14	8
“Musculoskeletal disorders” and “lecturers”	6	6
“Digital well-being”	76	110
“Digital well-being” and “lecturers”	0	0

Table 1. Bibliographic records by the query in the Web of Science and Scopus databases in 2000-2022 (Source: Author, accessed 2023/01/13)

QUERY[1]	YEARS						
	2000	2005	2010	2015	2020	2021	2022
“Musculoskeletal disorders”	141	327	799	1,174	2,146	2,520	2,346
“Musculoskeletal disorders” and “university”	5	8	113	176	384	488	430
“Musculoskeletal disorders” and “lecturers”	-	-	-	1	2	2	-
“Digital well-being”	-	-	-	-	13	20	27

Table 2. Bibliographic records by the query in the Web of Science Core Collection in 2000-2022 (Source: Author, accessed 2023/01/13)

Workers who have predominantly sedentary work and sit incorrectly can have MSDs. However, they need to realize it or evaluate their posture and adopt a more appropriate one. Corrective measures include various practices. Some employers implement stretch training exercises (Holzgreve et al., 2021) integrated by exercise specialists or the individual guidance of a healthcare professional designed to reduce the economic and individual burden of prevalent and incident neck pain and headache in office workers (Aegerter et al., 2020). The most robust approach to the MSD prevention represents to design of an organizational strategy that can combine several policies (Cole & Wells, 2002). It

may accomplish the maximum of the following:

- workstation ergonomics (Baker et al., 2018; Barbieri et al., 2022),
- human resource activities, e.g., supervised on-site face-to-face visits (Sharifi et al., 2022), health promotion information workshops, stretch training, and health care benefits,
- restructuring work organization, e.g., promotion of teamwork and job re-design,
- changes in a work environment and work regime, e.g., flexible time regime and self-rostering - development of information systems,
- implementing the smart office using sensors to monitor and control working conditions in real time (Jun et al., 2019; Zhang et al., 2022).

2. Methods

The methods insist firstly on analyzing secondary sources from the Web of Science and Scopus databases for getting an overview of the state-of-the-art. It provides guidelines for leading interviews about risk prevention of MSDs in micro and small enterprises and public universities in the CR. Interviews were semi-structured, and their structured part described the respondents' personal characteristics, professional profiles, and job history. The interviews provided data for writing two narrative cases characterizing policies and activities that can prevent MSDs.

The interviews were held from October to December 2022. The first group of interviewees consisted of four OSH professionals, from which two respondents were aged 50-55, and two were 60+. They worked at the beginning of their career in large Czech companies, i.e., during the 90-s of the last cent. In these times, OSH often underwent outsourcing, and some OSH professionals established their micro-enterprises or began to work as freelance consultants. The second group of interviewees was held with seven academics, partly face-to-face and partly online. They provided an overview of their subjective evaluation of health and safety care at public universities. The academic respondents characterized the following structure: four women (two worked as assistant professors aged 30-40, one associate professor aged 55, and one professor aged 60+) and three men (two of them employed as assistant professors aged 45-50 and one professor aged 60+). They all have pedagogical experience at public universities for at least five years, and they use their home office almost daily for online teaching, solving projects, and meetings). One has established and managed his own micro company, and another a non-profit organization. The results of two interviewee groups are used for writing case studies to illustrate the working conditions of digital workers. Both probe into the Czech reality of segments where MSDs can become a long-term issue.

3. Results

This section includes two narrative cases describing digital work, firstly in micro and small enterprises and secondly at public universities. The case of universities focuses on the digital well-being of higher education lecturers as they represent a crucial labor force in the sector, and indications of the secondary sources provide a worry that they suffer MSDs.

3.1. Case: MSDs in micro and small enterprises

OSH management in Czech micro and small enterprises is a long-term issue. Their OSH systems can describe a wide variety of used practices. Since 1993, when the Czech Republic was established, the economic environment has generated a real challenge for change. The primary support and controls aim at developing risk management, compliance with professional standards, and the quality of outsourcing OSH.

For a small company in the CR with up to 25 employees, the law allows risk prevention, including OSH documentation, to be carried out by the employer, a small entrepreneur, or a self-employed person. Therefore, there is no need to have any certificate or certificate of professional competence in health and safety. The owner-manager of a small company is usually the person who must take personal responsibility for most management matters, e.g., sales,

procurement, accounting, production planning, and personnel – all processes crucial for the firm's survival. The tasks that contribute to the short-term survival of the business become crucial and are perceived as the highest priority. OSH usually turns out to be only a peripheral concern with low attractivity for investments. Therefore, safety and health prevention usually become on the edge of activities done by small enterprises. Many owners consider health and safety issues part of the workers' professionalism or craftsmanship and assume that employees are primarily responsible for their health. So, no time is given to learning about health. However, OSH workers' expertise is often limited or even absent, mainly regarding MSDs prevention. An exception can be long-term exposure to chemicals if individual employees experience health-related problems such as low-back pain or headaches from toxins. Small firms usually take care of noise reduction by wearing hearing protection at the workplace. They gradually accept other risk factors, partly due to long-term campaigns, OSH training programs provided by the Occupational Safety Research Institute, or controls by employment agencies and labor inspectorates.

The exposure to psychosocial risks is lower in micro and small enterprises compared to large ones. It can explain as benefits being employed there due to the relatively large autonomy for the workers, more significant variation in tasks, a less strict division of labor, and shorter exposure times to other health risks. The working environment recognizes as friendly because personal matters consider each other when planning daily tasks and working regimes. Employees receive opportunities to develop broader competencies helping them to replace and support each other's if needed.

Micro and small enterprises do not systematically identify risk factors and take preventive actions accordingly. Economic and health consequences caused by MSDs are undervalued and on the edge of consideration. The reasons for the OSH improvements differ for them compared to larger companies. Economic drivers especially play a vital role when they make decisions about investments. Owner-managers motivate more the client requirements or encouragement from their critical customers than the legislative obligations in the labor law. They concentrate on the working atmosphere necessary for mastering the daily operations of their business. Even though good OSH practices are readily available online, micro, and small companies seldom use publicly offered recommendations. They instead turn to personal contacts for advice. The crucial influence on their behavior is when a severe accident occurs or when the manager has an experience as a co-worker in the same business. The owner-managers often tend to pursue compliance with generally accepted OSH standards for their sector when the best practice is more tangible than abstract legislative requirements. They appreciate it when it contributes to their professionalism and supports the excellent brand.

3.2. Case: Digital well-being of higher education lecturers

Higher education institutions (HEIs) compete on a global scale by providing online courses that attract applicants from various backgrounds. The interviewed higher education (HE) lecturers see the accelerated rush to distance teaching as a threat as the spotlight has too often centered on the hardware, software, and digital infrastructure. Their digital well-being remains on the edge of university HR policy and practices. They agree that lecturers must adapt to a vast transformation, like the new demands of online classroom environments, prolonged screen time, improvised home offices, and “always on” student communications. Conversely, the minimum achieves to improve their working conditions. Online teaching causes new challenges, which lead to stress and affect teaching performance and quality. The quick digitalization speed due to the COVID pandemic led to radical changes during a short period. Universities have implemented distance education using home offices with minimum skills to apply online platforms effectively. The OSH regulations in the Labor Code are solved by signing an employment contract amendment that shifts the responsibility for OSH onto the lecturers without any deals in home office quality and ergonomics.

Nowadays, HE lecturers expect a better understanding of the consequences of poor workstations on their health, MSDs, and psychosocial balance. Less experienced lecturers are feeling the fear of missing out on social media. They worry that online content and interactions from others are unseen and try to be constantly in touch in real-time, which leads to anxiety, interrupted sleep, lack of concentration, and dependence on social media. Being in touch with the

regime 24/7 emphasizes a need to be disciplined, self-managed, and have the will to avoid procrastination on social websites. Procrastination on social media causes worsening their academic performance and well-being. Persons with lower self-discipline are inclined to be constantly connected and updated whenever they receive a notification, as they believe they must interact immediately, seeking relatedness and popularity.

Specific pressure on mental health creates a blurred perspective of an academic career. Senior lecturers usually have fixed-term employment contracts, so they feel employment uncertainty. Achieving an employment contract for an indefinite period is seen as an unattainable goal because the requirements to become an associate professor are increasing. Climbing the academic ladder puts the weight on publishing in high-quality journals and doing research projects financed by renowned institutions.

Digital well-being creates challenges for both universities and HE lecturers. Interviewees believe academics are motivated to develop their skills to offer good digital teaching. Most want to participate in designing policy and organizational culture around digital well-being without negative consequences on their well-being, incl. MSDs. In the current environment, digital capacity must refer not only to the digital infrastructure and technical skills (the clever use of hardware and software) but also to the professional knowledge and personal skills needed to engage with digital technology safely and responsibly. They suppose that an acceptable way how to avoid health risks and threats to physical and psychological well-being is to provide training and monitor working conditions. However, HRM must provide training programs that safeguard them over time and include the best practice for effective MSDs prevention. HEIs must take a broader view of digital readiness and understand that resilience - the ability of teachers to withstand changes – if digital education becomes a vital part of managing an effective and sustainable shift towards online learning. Moreover, HEIs can make an innovative contribution to digital transformation by directly training programs dedicated to HE lecturers and aiming digital well-being at managers and university officers to boost their organization’s digital well-being performance. The fact that resources are digital, for flexible remote use, and adapted by HEIs is vital to maximizing the quality of the impact of digital technology on their work.

4. Discussion

MSDs and digital well-being represent essential aspects of modern life, especially in the context of increased computer and smartphone usage. Addressing MSDs and promoting digital well-being can have numerous physical, mental, and social benefits for individuals and organizations. However, in the CR, risk prevention, including MSDs, in micro and small enterprises has been a long-term issue. Owners and managers mainly pay attention to the key business that is decisive for success or survival. HRM of these enterprises, predominantly administrative, remains with OSH on the edge of any activities. The main emphasis on compliance with legal regulations and risk prevention concentrates on the effective use of personal protective equipment and compulsory OSH training, even though the best practices are available online, e.g., the OSH courses and training provider represents the Occupational Safety Research Institute. Micro and small enterprises systematically identify no risk factors at workplaces or implement a risk prevention system. MSDs are not considered a part of personnel management/HRM. However, they can discuss it as a precondition for socially responsible employment. This approach exists when the owner or one of the employees has experience with MSDs. Then the purpose becomes to prevent negative consequences when creating working conditions or when there is an urgent need to reduce the negative MSD impact on the decline in productivity and sick leaves, e.g., by including the stretch training exercises in compensation and benefits. However, in short, or middle periods, any significant change cannot be predicted due to the economy's position that expects high inflation, input costs, and tax increases.

HEIs must compete globally and are under global pressure to achieve a good rating compared to the top universities. The top management of Czech universities tries to find an HR strategy that can use the best HR practices to recruit talent and retain critical persons; however, limited budgets are a crucial obstacle to mastering this challenge. Based on financial possibilities and the situation in the local labor market with academics, the HR policy and practices deal with

keeping a good brand among other universities, nowadays to become attractive in the field of distance education and comply with the legislation and obligations agreed by collective agreements. Issues like risk prevention and the consequences of MSDs on staff health should be getting attention. It depends on HE lecturers´ activities and knowledge if they implement in their home office the best ergonomics when they work online. In two years, interviewed lecturers see more chances to improve the current stage; however, the public authorities provide online available practices or recommendations on how to design workplaces in the most convenient and healthy space.

5. Conclusions

Musculoskeletal disorders have become a side-effect of digital transformation and innovations in almost all economic sectors. They generate a work-related health problem and bring about the most common occupational disease in the EU. Gender, age, and lifestyle influence differences in musculoskeletal disorders' prevalence and occupational consequences, lower productivity, sick leaves, and early retirement. The most prevalent symptoms of MSDs are in the lower back, neck, and shoulder regions, wrist pains, and eye syndrome.

Narrative cases characterize the situation in two segments of the Czech economy: firstly, micro and small enterprises, and secondly, public universities. Employers in both sectors care for occupational safety and health that primarily comply with the Labor Code requirements. However, the MSD risks resulting from sedentary jobs and digital work for long daily hours are not still subject to their monitoring or prevention. Responsibility for the home office design is transferred to employees. Employers usually believe that employees´ professionalism ensures the right approach to work tasks and ergonomically optimal conditions for the home office. So, they pay no attention to the MSDs problem at the home office or any prevention policy. Distance education at universities focuses on providing students with the best quality of online services; however, the digital well-being of HE lectures is not yet subject to HRM universities.

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