Smart working to support sustainable open innovation

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Recommended Citation

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Abstract. Organisations are called upon to adopt Open Innovation approaches in an era where Digitalization is increasingly in demand, especially during the Covid-19 pandemic. The topic of Open Innovation is closely intertwined with Digitalization. This paper discusses the value that smart working can contribute as an Innovative and Sustainable Open Innovation approach. The key pillars on which the smart working culture is based, such as collaboration, individual autonomy and teamwork, and how these influence job satisfaction and performance are briefly discussed. Finally, the paper presents a research proposal to create a platform to support smart working employees.

Keywords: Smart Working, Digitalization, Agile work, Open Innovation.

1 Introduction

Technological progress has expanded how most everyday work activities can be performed. Work has always been characterised by the need for the worker to perform tasks in a specific location and at predetermined times. Today technological tools (such as portable devices, wi-fi connections or ultra-wide bandwidth) have considerably extended the options for flexibility, allowing the worker not to be physically present in the places of his or her organisation and to offer his or her contribution even at times other than the usual ones. In this context, organisations must equip themselves with a dynamic, innovative mindset, open to the sudden changes and challenges that the world requires. Companies must ensure they have the right tools to continue creating value. The Covid-19 pandemic has made organisations realise more than ever the importance of Digitisation, a concept already recurring with the spread of Industry 4.0 [1]. Smart working was the new way of working for companies during the Covid pandemic [2]. The term 'smart working' has been used to characterise a workplace transformation across various aspects [3]. 'Changes in work practices, work cultures, company structures, premises, decision-making, communications, and cooperation,' according to these authors [3]. There has been a shift in the role of location in professional activities, with more opportunities for cooperation, employee autonomy, talent management, and a focus on innovation [4]. Flexibility is a vital component of contemporary, smart working methods, according to Lake [5]. On the other hand, smart work is more than just flexibility and

eliminating places. Smart working is part of the digitalisation process, part of the Open Sustainable Innovation macro-context. Researchers and companies are becoming more aware of the importance of Sustainable Open Innovation. Ongoing economic changes, increasing complexity, and serious environmental problems are forcing companies to change and modify existing innovation methods or, in some cases, to introduce radically new ones[6]. Innovation plays a crucial role in fostering a higher level of sustainability in business operations. Innovations such as smart working that contribute to sustainability are therefore called Sustainable Open Innovation. Smart working, a relatively recent phenomenon, which has spread overwhelmingly, especially with the outbreak of the Covid-19 pandemic, could in the not too distant future become the new way of working. It is, therefore, necessary to investigate the correlation between smart working and employee satisfaction, which is then reflected in job performance. This paper attempts to answer the following research question: how has the sudden practice of smart working impacted employees? This paper explores how Covid 19 has challenged traditional working methods by rooting new working arrangements. The first part of the paper focuses on the concept and literature review of Smart working and Open Sustainable Innovation related to using digital tools.The second part of the paper focuses on the indicators that can affect the performance of a smart working organisation. Smart working is only sustainably effective if employees do not negatively perceive this way of working. Our research wants to investigate smart working starting from the critical issues that have emerged from recent literature to know if technological instruments can support a manager to help smart working employees work better. Finally, we propose a research methodology to investigate indicators of the psycho-physical well-being of smart working employees to design a support tool for employees themselves. The COVID-19 epidemic brought about radical changes in the working world, including smart working to cope with the lockdown. Agile working methodologies favoured by the introduction of enabling digital technologies have been implemented in a matter of weeks. This has brought benefits but also critical social, organisational and psychophysical challenges.

2 Investigation scope

The Covid-19 epidemic has made smart working the new way of working for millions of employees worldwide. Due to the sudden outbreak of the pandemic, almost all companies had to suddenly switch to smart working for the first time without preparing employees. Until 2019, Eurostat data indicated less than 4 percent of total employees working remotely in Italy, a percentage almost one and a half points lower than the European average. Since February 2020, the focus on smart working has increased unprecedentedly. In Italy, we have experienced a turning point in the history of smart working becoming the prevalent work mode. In Italian legislation, agile working, or smart working, is understood as that mode of execution of the subordinate employment relationship characterised by the absence of time and space constraints and an organisation by phases, cycles and objectives; presupposing a profound change and a radical and innovative revision of the company organisational model. Smart working implies that the worker is not tied to a physical presence in the company, but

can choose the place where to work, and the enabling factor is digital transformation, which allows workers to operate outside the company and communicate-collaborate with their team, increasing productivity and the involvement of human resources. As a relatively recent phenomenon, there has not been much pre-pandemic research on smart working practices and their impact on employee performance and satisfaction. Furthermore, contemporary literature appears fragmented and conflicting on the advantages and disadvantages of smart working. Studies indicate that smart working is associated with higher sively to higher levels of employee participation in company life and higher performance, and greater organisational effectiveness [7]. These aspects represent a reason for interest not only in the academic world but also in the business world; the latter could be incentivised to introduce this way of working in their organisation, not only to meet the needs of workers, but also to achieve strategic results in organisational arrangements and/or personnel management, and also to have environmental sustainability benefits and a reduction in costs for the company. Disadvantages might arise, too, in any case. With smart working, it is not always possible to diversify the place where we are according to the activity carried out because it may coincide with the home and may lead to lower work performance, more distractions due to the sharing of space; there is also less physical contact with colleagues with a consequent potential reduction in the worker's social life, encouraging stressful situations. Working time becomes so flexible that it induces the worker to be active all the time: 'working anytime, anywhere' could easily turn into 'working all the time, everywhere', generating so-called technostress [8], understood as the excessive and harmful use of technology and recognised as an occupational disease (Consolidated Act on safety at work), which can give rise to anxiety, insomnia, migraine, impacting on attitudes, thoughts, behaviour and psyche. All of this results in a decrease in individual performance and, as a direct consequence, company performance. This paper aims to increase the presence of occupational and organisational psychology contributions on this topic by pursuing three objectives. The first is to describe the regulatory evolution which has given rise to that peculiar form of flexible work, that is, agile working, or smart working, in the Italian context, outlining the areas of similarity and overlap with similar forms of flexible working found in the international literature. The second objective is to describe the main results of international research on some psycho-social factors connected to flexibility in working hours and places and the effects it determines; in particular, work-family conflict, identification and commitment with the organisation, interpersonal relations with colleagues, job satisfaction and job performance will be examined. Finally, the third objective is to reflect on the usefulness of the design and organisational validation of an innovative multi-channel platform capable of supporting, using artificial intelligence models, company managers in monitoring worker well-being and the company climate, enabling them to implement strategies to reduce psycho-physical stress and improve the company climate.

3 Literature Review

3.1 Smart working considerations.

Chartered Institute of Personnel and Development [9] described the nature of smart

working more than a decade ago, and today it is being proposed to us as something new and different. Complicit in this is the evolution of technology and the latest mobile and wireless developments, whose enabling role is far from neutral. This mode of work delivery is connoted by a profound change in culture, processes, spaces and relationships among individuals. In the European context, agile working has been slow, although some experimentation has been done. Following the various attempts to revise the EU Working Time Directive, the focus shifted to the issue of 'rights to disconnect'.This legislation aimed to give workers more flexibility and autonomy in their work and organisation. The new regulation can be considered an evolutionary version of teleworking as defined by the European Framework Agreement on Telework. Compared to teleworking, smart working makes use of the newest and most modern technologies available for performance optimisation [2]. Although with some differences in scope, this 'right to disconnect has been introduced in France, Italy, Spain, Belgium and other countries. In Italy, the Right to disconnect is provided for by Law no. 81/2017. If we briefly retrace the history of smart working in Italy, the legislative initiatives were Presidential Decree No. 70 of March 1999 and the Deliberation of the Authority for Information Technology in the Public Administration No. 16 of May 2001; both concerned only the Public Administration and in them, telework was understood as a way of carrying out work from a location other than the usual one. Only with the Interconfederal Agreement of June 2004 was the private sector also affected by a measure on flexible working. On that occasion, some of the major trade unions and Confindustria transposed the European Framework Agreement on telework of 2002, which mentioned the possibility of concluding agreements aimed at the performance of work activities at locations other than company premises and with timetables that were not predetermined. With this agreement, the issue of hourly flexibility found its first introduction in Italy in a collective bargaining text. However, it cannot be ruled out that employees and employers had already adopted such measures informally before the actual institutional recognition. After several years, and only with Law No. 81/2017, our Country has sanctioned with a single legal norm, valid for both the public and private sectors, the right of organisations and workers to implement flexible forms of work, formalised in writing and broader than the telework regulations. Flexible working, which was initially referred to as 'agile working (or smart working)' during the parliamentary process, is referred to in Law No. 81/2017 as 'agile working' only. Unlike the provisions on teleworking in the Public Administration, the law does not place constraints on spaces and hours (if not on ceilings per day/week). It specifies that the purposes pursued no longer concern, as was the case with Presidential Decree no. 70/1999, savings requirements, but the increase in competitiveness and the reconciliation of work and lifetimes. Another European country that has taken action, even before Italy, is the United Kingdom in 2014 with the Flexible Working Regulation. On the other hand, no national law has been enacted on agile working rights in France, but more attention has been paid than in Italy to the Right to Disconnect. Although there is as yet no proper regulation governing exactly this field, and a vast body of studies on the possible consequences and benefits it can bring is still lacking, much can be examined from the perspective of sustainability with a focus on work-family conflict, job satisfaction, organisational identification and commitment, interpersonal relationships with colleagues and job performance. In this

regard, the European Union intends to implement a type of smart working geared towards green transitions and digital sustainability. This will be discussed in the following chapters. In the organisational literature, the definitional issue is very complex. The design and implementation of forms of work organisation require the analysis of two dimensions:

● technique
● social

The former includes technologies, tools and KH, while the latter includes people, groups and structures. Both dimensions are interdependent and interrelated [10]. The theoretical perspective that best interprets SW is the socio-technical one, which is the assumption that change requires a design perspective that focuses on the use of technology in reorganisation but is also human-centred, as interaction is a key element. As already mentioned, smart working was defined by the CIPD in 2008 as a new approach to work organisation that reconciles effectiveness and efficiency in achieving objectives through flexibility, autonomy, collaboration and optimisation of tools and the work environment. From a review of the scientific literature published between 1972 and 2000, SW is seen as an evolution of traditional organisational models [11]. It outlines a dynamic model in which the organisation must be 'smart' in identifying strategic and organisational practices, policies, structures, processes, methodologies and innovative tools [12]. Spatial and temporal flexibility, supported by technological tools, provides optimal conditions for performing one's tasks and requires a rethinking of spaces and ways of relating. The concept of SW also evokes the main challenge to be faced, the change that affects not only technological and process aspects but the organisation's culture that can lead to high performance, increased productivity and greater job satisfaction [11]. Linked to the concept of SW is the smart worker, i.e. the one who works with technology that influences not only decision-making processes but also the content of the work task [13]. For this reason, the worker needs to develop new skills and refine those that have long been discussed [10]; [12 [14]], flexibility, speed, and the ability to find information. The smart worker must be able to easily interact with other members of the organisation, even geographically distant, minimising any time and physical constraints [15]. Since he/she may face problems related to social and spatial isolation and a work culture geared towards constant availability, he/she must acquire an ability to consciously and reasonably manage work commitments, avoiding an intensification of his/her efforts [16]). The paper aims to contribute to the debate in the organisational field by investigating the possible relationship between SW, job satisfaction Open Sustainable Innovation.

3.2 Sustainability and open innovation

Steiner [17] found that in literature, Sustainable Open Innovation assumes only an environmental connotation, neglecting a definition from an economic, ecological and social perspective. Other researchers have also confirmed that 'Sustainable Open Innovation' is only related to environmental considerations [18]. Only Hansen and Grobe-Dunker gave a 'corporatist' and 'commercial' definition, defining Sustainable Open Innovation as: "The commercial launch of a new (or improved) product (service), product-service system, or pure service that, based on a traceable

(qualitative or quantitative) comparative analysis, results in environmental and/or social benefits over the prior version's physical life-cycle ('from the cradle to the grave')" [18]." As a result, we describe open sustainability innovation as "an approach by which open innovation practices combine with the sustainability idea" rather than "an approach by which open innovation practices merge with the sustainability concept"[20]. Companies that pursue this logic of Sustainable Open Innovation must communicate these corporate values to their internal team, stakeholders, and end consumers. Therefore, it is crucial to communicate their sustainability internally and externally. Sustainability also affects corporate reputation [21] and impacts positive or negative perceptions of business activities [22]. Therefore, a current challenge for organisations to redefine sustainability communication lies in using new digital delivery channels. We clearly understand why digital transformation and Sustainable Open Innovation fit together in different ways and forms.

4 Smart Working, to support Sustainable Open Innovation

There is a need to communicate corporate sustainability through new Digital Open Innovation tools. Recent studies have focused on the link between sustainable innovation and smart working practices [23]. Several authors have found a positive correlation between applying a fully digitalised approach and sustainability. During the lockdown, all companies ended up in smart working, and the levels of air and water pollution and noise decreased. River waters increased in cleanliness, clarity, and other practical advantages to people and the environment [24] . Because people work from the comfort of their homes, smart working has shown to be an effective way to protect the environment, gain time, and produce more productive employees. According to Garanti [25], remote working trends are expected to continue after the pandemic. With smart working, technological and social systems come together to co-create new value. [26] see smart working as an opportunity for lasting behavioural change to reinforce the positive impact on the environment, where employees feel they are proactively participating in sustainability. McEwan [27] sees smart working as a functional Open Innovation tool based on agile, dynamic organisations that co-create value for business and people. Underlying the practice of smart working must be an ideology and a corporate culture oriented toward Open Innovation, an open, change-oriented culture shared by all members. Smart working requires constant collaboration between employees to align tasks and exchange knowledge. It is an open way of working, where each employee can see the work of others to leave feedback, discuss it together and propose different solutions: in this way, added value is co-created. Employees must contribute actively, express their creative energy, and collaborate to generate new ideas [28]. According to Junca-Silva et al. [29], employees in companies oriented toward Open Innovation and Digitalisation must be encouraged to express and exercise their creativity, forming meaningful interactions between colleagues and with customers; they are therefore not passive recipients of their work, but actively contribute to co-create and promote sustainability throughout the life of the organisation: this, according to Junca-Silva et al. [29], is the fundamental prerequisite of those who adopt smart working. Collaboration extends to consumers and clients, frequently the key to successful innovation. The permeability

of organisational borders to external ideas, resources, and personnel flowing in and out was underlined by Dahlander and Gann [30]. As a result, an age of Open Innovation is proposed, which is defined as "a paradigm that posits that enterprises may and should employ external ideas as well as internal ideas, as well as internal and external pathways to market, as they seek to progress their technology" [31]. Information activities include information exchange, interpretation of objectives and data, and collaborative activities with colleagues, possibly through tools such as virtual collaborative whiteboards. As far as decision-making is concerned, it is done by all levels of the company because everyone is free to bring out their considerations. All opinions are useful, as they add value to the enterprise. Error is tolerated as a learning opportunity. Organisations that are perceived as successful are those in which enthusiasm, creativity and teamwork are continually involved, contributing to the co-creation of corporate value.

4.1 Job-related satisfaction

Although the results do not provide unambiguous answers, one of the consequences of agile working that is most frequently examined is job-related satisfaction. Job satisfaction is defined as the positive employee attitude resulting from the evaluation of the work experience [32]. There is no unanimous consensus on the job characteristics that influence job satisfaction [33]. Marino et al. [34] stated that the factors that can influence job satisfaction should be divided into two macro dimensions of well-being: well-being understood as job satisfaction, which includes the sense of belonging to the company, interaction and social exchange with colleagues, the purpose of job autonomy left by the manager, commitment and work involvement; and well-being understood as emotional, psychological, mental well-being, which includes work-life balance, the affective dimension.

Working conditions such as low or inadequate job autonomy, excessive demands and work overload, and lack of social relationships or support from colleagues or managers can negatively influence smart working [35]. On the level of personal well-being, a lack of work-life balance can lead to excessive teleworking, which causes technostress. Empirical evidence on the association between smart working dimensions and employee satisfaction is very mixed [36]. Malik et al [37] and Zammitti et al. [38] argue that employees have a positive attitude towards smart working and prefer it to office work. Other research, however, such as the meta-analysis conducted by Gajendran and Harrison [39] and De Menezes and Kelliher [40], found little correlation between worker satisfaction and smart working practices. Remote working and its dimensions are both positively and negatively related. This paper explores the role of the work as mentioned above and personal mediators on the level of positive employee attitudes and job and personal satisfaction. The various dimensions that could influence the efficiency of smart working are described below.

4.2 Work-life conflict balances

One factor contributing to the decision to request access to flexible forms of work is work-family conflict, understood as the level of incompatibility generated by demands

that are difficult to reconcile between work and family life [41]. The conflict between work and family often has important repercussions for an organisation, such as reduced performance, increased turnover, and family balance [42] It is reasonable to assume that flexible ways of performing one's work activities can improve work and personal life. However, research on the effects of smart working on work-life balance is extremely contradictory [43]. According to McDonnel et al. [7], agile working arrangements lead to a better work-life balance. This has a positive mediating role in reducing stress and increasing employee satisfaction and well-being. In an extensive survey of nearly 25,000 IBM workers in 75 different countries, Hill, Erickson, Holmes and Ferris [44] observed that if working from home has decision-making margins in planning one's work, it would be associated with a significant reduction in work-family conflict. Although subject to cultural differences between countries, this effect would be greater in cases where workers perceive greater control over the scheduling of work hours and the choice of time to work and are more able to organise their personal and work time. However, the review of studies conducted by Allen, Golden and Shockley [45] concludes that remote working appears to have a limited effect on reducing work-family conflict. This seems to be so since the family responsibilities of an agile worker may increase, given that the person to work, 'stays at home all day'. Studies conducted by Deters also showed that smart working employees were not able to find the best work-life balance due to the interference of family duties or the presence of relatives at home, the presence of partners and children (especially those still in infancy) engaged in work and school activities, and having to contribute to household chores strongly affected the work-life balance [2]. Many workers lack the self-management skills of work-life balance and are workaholics, not knowing when to stop and take breaks. These increases work stress. Smart working, increase the use of technology, and pushes some workers to overuse it, even beyond working hours, with the risk of exacerbating conflicts in family and personal life. Another aspect that should not be underestimated, as highlighted by the meta-analysis of Gajendran and Harrison [39], is the time required for the worker to adapt to smart working:

The work-family conflict appears to be lower in those working remotely for more than a year compared to those using this operational mode for less time. Finally, the results of the study conducted by Di Tecco et al. [46] showed that flexible working generally leads to a better perception of work-life balance. However, this balance decreases for female employees, who find it more difficult to find a work-home balance as they are more involved in family and household care [47].

4.3 Identification of organisational commitment

Another aspect that needs attention is whether adopting specific flexible working arrangements in terms of space and time may influence the level of identification and commitment that individual workers have towards the organisations of which they are members and how to measure it. If on one hand, it has been hypothesised that the geographic separation of remote workers and their distance from elements such as their own office or other corporate symbols may make workers feel more detached from their organisation [48], on the other hand, it has been questioned whether these same factors may attract certain categories of workers such as, as hypothesised by

Martin and MacDonnell [7], young people. For these reasons, several researchers have investigated the relationship between flexible working and identification with and commitment to the organisation. In a study of over 20,000 public administration workers in the United States, Caillier [49] observed that workers who teleworked frequently had lower levels of commitment than their colleagues who teleworked, on average, less than one day per week. In addition to this, civil servants are frequently teleworking or smart working also had lower levels of organisational commitment than their colleagues who were always present in the office, those who could not telework due to technical problems or the impossibility of adapting their tasks to this modality, and those who had given up teleworking by choice. These workers only had higher levels of commitment than workers who had applied but were denied the possibility of agile working. Therefore, this latter study also suggests a curvilinear, inverted U-shaped relationship in which excessive use of remote work may result in lower commitment to one's organisation. Similar results were found by Bartel, Wrzesniewski and Wiesenfeld [50]. The previously mentioned authors, in two studies involving newly recruited workers in the first case and workers with high seniority in the second case, investigated the relationship between distance from work and organisational identification. Understanding remoteness from work as physical isolation, i.e. the degree to which employees report working neither in the main office nor in environments where other members of the organisation may nonetheless be physically present (e.g. client companies or telecentres), the researchers observed that such isolation is negatively correlated with identification with one's organisation, both among newly recruited workers and among those with greater seniority. Moreover, in both cases, the relationship was found to be mediated by the perception of respect; in other words, workers who feel physically isolated feel that they are not very included and not very valued members of their organisation, which explains the lower levels of organisational identification and decreased id performance.

5 The Technological Innovations for Corporate Welfare Project post covid

The Technological project Innovations for Corporate Wellbeing post-COVID (ITeBA) aims to study and implement an improvement and reorganisation of work processes and activities carried out in smart working through innovative support technologies that make use of artificial intelligence and Deep Learning to assess the psycho-physical wellbeing of workers, the corporate and organisational climate and propose improvement actions with a view to sustainability. According to Bednar and Welch [51], many smart working initiatives seem to be motivated by a cost-saving rationale, without any real intention and mindset toward Digitalisation. Consequently, this creates a telematic enterprise in which disorder, dissatisfaction and inefficiency reign, which does not translate into effective change [52]. Also, smart working has been a prevalent practice in the past year due to the pandemic, which forced this abrupt and sudden shift to online mode due to force majeure. Many companies were not prepared either culturally or in terms of means, and this generated adverse effects on employees (which consequently affected company performance) such as:

- Sense of isolation and bewilderment.
- Lack of digitalisation skills: many employees, especially those over 50, may be unfamiliar with electronic devices.
- Generation of stress due to inability to reconcile work and private life in one (home) environment.
- Working in an environment with environmental distractions like home can decrease employee productivity and engagement, increasing stress.

People may wish to engage in smart working, but they require greater access to support services. Therefore, it becomes increasingly necessary to ask how smart tools can support these digitalised organisational practices. Meaningful support practice is needed to realise this shift towards smart working [51]. Thus, aspirational statements of smart working must lead to the design of employee-centred socio-technical systems. According to Mumford [53], the socio-technical perspective focuses on improving employees' work experience and working environment by including human-available technologies such as the internet of things or artificial intelligence. This study aims to propose a project consisting of an innovative platform equipped with Artificial Intelligence capable of supporting the employee's work and psychological well-being, enabling the implementation of socio-technical strategies to reduce those factors that cause psycho-physical stress. In this project phase, a comparison will be made between the results of the INAIL questionnaire conducted in the pre-pandemic period. The dimensions of work wellbeing and psycho-social wellbeing explained in the previous paragraphs were taken into consideration as moderators of employee satisfaction in smart working. The aim is to re-use a preliminary data collection approach to analyse and define the factors useful for correctly detecting situations of psycho-physical stress and deterioration of the company climate. For this preliminary analysis, reference can be made to the longitudinal study conducted by Inail; the National Institute for Insurance against Accidents at Work is an Italian non-economic public body that manages compulsory insurance against accidents at work and occupational diseases. In 2019, INAIL developed a pilot project on smart working, allowing employees to work remotely one day a week for one year, from January 2019 to December 2019.The pilot project aimed to monitor and test the use of flexible work in a sample of 319 people aged between 25 and 64 (70% women, 30% men). The questionnaire aimed to collect information on work organisation, psycho-social risks, work-life balance, use of new technologies, attitudes towards teleworking (understood as commitment and involvement), and mental and general health and well-being. By filling in an online questionnaire, workers were invited by e-mail to participate in the study. At the outbreak of the covid pandemic, now that the pilot project was no longer a hypothesis but had become an everyday reality, the present authors wanted to test the actual impact of the smart working experience on worker satisfaction. Online questionnaires were conducted on the same sample of workers taken by INAIL during the lockdown - from February 2022 until May 2022, referring to the same indicators considered in the questionnaire previously conducted by INAIL: self-management of work-life balance, attitude towards smart working (commitment and work involvement), work organisation understood as relationships and mutual support with colleagues also at a distance. The results were compared with those that emerged from the INAIL study

the previous year to answer the following question: now that workers have been "forced" to work in smart working every day and for a continuous period, have any deviations from the previous study been found? For reasons of length constraints, not all results have been fully explained. Briefly, the present authors examined the influence of work commitment, work-life balance, the collaboration between colleagues and their impact on job satisfaction and job performance. The comparison results revealed stress from the sudden change in working methods, which took time to align, especially for those who did not have many digital skills. Smart working caused half of the sample to feel "having to be constantly active", causing a strong imbalance and discomfort between work and private life. Especially for female workers, it was very complicated to manage work and private life in a balanced way, causing them much stress. Concerning the factor 'work involvement and commitment', higher levels of distraction were found for those married workers with one or more children, especially children. Following the analysis of the results, the present authors intend to develop a monitoring dashboard and a prototype solution of web-based technology to monitor the critical elements of psycho-physical work well-being. The platform's objective is to define, design and prototype a web-based platform capable of monitoring the level of psycho-physical stress and techno-stress during work activities in smart-working mode. Employing Deep Learning and Computer Vision technologies for affective computing, the platform should recognise signals previously indicated in images captured through the webcam of digital instruments in use. The preliminary analysis involves:

● Facial expression (based on the facial action coding system defined by Ekman and Friesen [54].
● tracking of the user's head (particularly with flexion, rotation and extension analysis).
● Gaze and eye-tracking.

   The proposed platform will be able to perform the following functions:

 ● Analysing the worker's stress level reactively (issuing stress prevention alerts) by tracking the user's head (particularly with flexion, rotation and extension analysis).

● Analysing the worker's satisfaction

● Analysing the worker's attention, gaze and engagement while he is working, alerting him at times when he is distracted
● Highlight stress factors via dashboards to define appropriate proactive strategies for reducing and maintaining the corporate climate gaze and eye-tracking.

6 Conclusions and implications of the platform on companies

The emergency caused by Covid called for the implementation of the practice of smart working. Companies worldwide faced this new challenge by taking it as technological evolution, an Open Innovation opportunity. Many researchers have considered smart working as a sustainable practice capable of creating new human

and social value. The literature presents both advantages and disadvantages related to smart working, so this article aimed to study the influence of some work and personal well-being indicators on employee satisfaction. The study showed that smart working could lead to technostress and decreased performance and work engagement. In this regard, the authors intend to develop a platform that helps companies maintain manageable stress levels in workers adopting smart-working modes. As the psychological and physiological well-being of workers depends on various reasons, varying according to many factors, as shown above, the platform stands as the means to customise the company's approach to each worker. In such a way, there is room for the co-creation of value for the company, which will benefit from the very best of each individual of its organisation. Such an approach implies that a wide range of reactions to stress levels and factors are investigated, as well as the subsequent actions to be taken on the company's side to prevent them and/or resolve them. It is highly recommended that the research extends to a wide number of companies belonging to different businesses to obtain a complete series of data, both on the qualitative and quantitative sides.

References

1. Ntasis, L., Koronios, K., & Pappas, T.: The impact of COVID19 on the technology sector: The case of TATA Consultancy Services. Strategic Change, 30(2), 137-144 (2021)
2. Galanti, T., Guidetti, G., Mazzei, E., Zappalà, S., & Toscano, F.: Work from home during the COVID-19 outbreak: The impact on employees' remote work productivity, engagement, and stress. Journal of occupational and environmental medicine, 63(7), e426 (2021)
3. Boorsma, B., & Mitchell, S.: Work-Life Innovation. Smart Work–A Paradigm Shift Transforming: How, Where, and When Work Gets Done, Cisco Internet Business 12 Solutions Group (IBSG) on https://www. cisco.com/web/about/ac79/docs/ps/Work-Life_Innovation_Smart_Work. pdf. (2011)
4. Hamel, G.: The Future of Management. Boston,: Harvard Business School Press (2007)
5. Lake, A.: The Way We Work. A Guide to Smart Working in Government. Norwick: HM Government, Efficiency and Reform Group Service Desk. Available at https://mindfood.visionmind.it/wp-content/uploads/2018/03/TW3-Guide-to-SmartWorking withcasestudies-5mb.pdf (2013)
6. Arnold, M.G.: "The role of open innovation in strengthening corporate responsibility". International Journal of Sustainable Economy. 3 (3), 361-379 (2011)
7. Martin, B. H., & MacDonnell, R.: Is telework effective for organizations? A meta analysis of empirical research on perceptions of telework and organizational outcomes. Management Research Review (2012)
8. Brod, C.: Technostress: The human cost of the computer revolution. Reading, Mass.: Addison-Wesley Publishing Company (1984)
9. CIPD: Smart Working the impact of work organization and job design [online].

London: Chartered Institute of Personnel and Development (2008) 10. Bednar, P., Welch, C.: Socio-Technical Perspectives on Smart Working: Creating Meaningful and Sustainable Systems. Information Systems Frontiers. 22, 281-298 (2021)

11. Iannotta, M., Meret, C.: Flessibilità, coerenza, integrazione: tre leve per una leadership efficace a supporto dello SW", Prospettive in Organizzazione – 13 (2020)

12. Dossena, C., & Mochi, F.: Smart Working: opportunità o minaccia? La parola ai professionisti.(2020)

13. Moore, P. V.: Who is the "smart worker"? Who should she be? Global Labour Journal, 11(2), 164 (2020)

14. Gangai, L: SW: una questione di competenze digitali!, Osservatori Digital Innovation, https://blog.osservatori.net/it_it/smart-working-competenze-digitali (2018)

15. Bolisani, E., Scarso, E., Ipsen, C., Kirchner, K., & Hansen, J.: Working from home during COVID-19 pandemic: Lessons learned and issues. Management and Marketing, 15(1), 458-476 (2020)

16. Taskin, L., & Devos, V.: Paradoxes from the individualization of human resource management: The case of telework. Journal of Business Ethics, 62(1), 13 (2015) 17. Steiner, H. J., Alston, P., & Goodman, R. International human rights in context: law, politics, morals: text and materials. Oxford University Press, USA (2008) 18. Hansen, E. G., & Grosse-Dunker, F.: Sustainability-oriented innovation. Encyclopedia of Corporate Social Responsibility: Heidelberg, Germany (2012) 19. Lui, J. H., Hansen, D. V., & Kriegstein, A. R.: Development and evolution of the human neocortex. Cell, 146(1), 18-36 (2011)

20. Arcese, G., Flammini, S., Lucchetti, M. C. and Martucci, O.: 'Open sustainability innovation in the food sector', Sustainability, 7, 8067–8090 (2015) 21. Reilly, A. H., & Hynan, K. A.: Corporate communication, sustainability, and social media: It's not easy (really) being green. Business horizons, 57(6), 747-758 (2014)

22. Gomez-Trujillo, A. M., Velez-Ocampo, J., & Gonzalez-Perez, M. A.: A literature review on the causality between sustainability and corporate reputation: What goes first?. Management of Environmental Quality: An International Journal (2020)

23. Swarnakar, V., Tiwari, A. K., & Singh, A. R.: Evaluating critical failure factors for implementing sustainable lean six sigma framework in manufacturing organization: A case experience. International Journal of Lean Six Sigma (2020)

24. Edison, R.E.; Juhro, S.M.; Aulia, A.F.: Transformational Leadership and Neurofeedback: The Medical Perspective of Neuroleadership. Internat. Journal of Organ. Leadersh, 8, 46–62 (2019)

25. Garanti, Z., & Berjozkina, G.: Introduction: what are the challenges and opportunities for tourism sustainability in Cyprus? Worldwide Hospitality and Tourism Themes, 13(6), 691-696. https://doi.org/10.1108/WHATT-07-2021-0103 (2021)

26. Bucea-Manea-Țoniş, R., Martins, O., Bucea-Manea-Țoniş, R., Gheorghiță, C., Kuleto, V., Ilić, M. P., & Simion, V. E.: Blockchain Technology Enhances Sustainable Higher Education. Sustainability, 13 (22), 12347.

https://doi.org/10.3390/ su132212347 (2021)

27. McEwan, A. M.: Smart working: Creating the next wave. Routledge (2016) 28. Hung, Y. Y., Lien, B. Y., Fang, S., & McLean, G. N.: Knowledge as a facilitator for enhancing innovation performance through total quality management. Total Quality Management, 21, 4, 425–438 (2010)

29. Junça-Silva, A., Silva, S. & Caetano, A. Job crafting, meaningful work and performance: a moderated mediation approach of presenteeism. SN Bus Econ 2, 31 (2022).

30. Dahlander, L., & Gann, D. M.: How open is innovation?. Research policy, 39(6), 699-709 (2010)

31. Wrzesniewski, A., LoBuglio, N., Dutton, J. E., & Berg, J. M.: Job crafting and cultivating positive meaning and identity in work. In Advances in positive organisational psychology (pp. 281-302). Emerald Group publishing limited (2013)

32. Locke, E.A. The nature and cause of job satisfaction. In Handbook of Industrial and Organizational Psychology; Dunnette, M.D., Ed.;Rand McNally: Chicago, IL, USA, pp. 1293–1349 (1976)

16

33. Astrauskaite, M.; Vaitkevičius, R.; Perminas, A.: Job satisfaction survey: A confirmatory factor analysis based on secondary school teacher's sample. Int. J. Bus. Manag. 6, 41–50 (2011)

34. Marino, L.; Capone, V. Smart Working and Well-Being before and during the COVID-19 Pandemic: A Scoping Review. Eur. J. Investig. Health Psychol. Educ., 11, 1516–1536 (2021)

35. Susanty, A.; Miradipta, R. Employee's job performance: The effect of attitude toward works, organizational commitment, and job satisfaction. J. Tek. Ind., 15, 13–24 (2013)

36. Eagly, A.H.; Chaiken, S. The Psychology of Attitudes; Wadsworth: Belmont, CA, USA, (1993)

37. Malik, A.; Rosenberger, P.J.; Fitzgerald, M.; Houlcroft, L. Factors affecting smart working: Evidence from Australia. Int. J. Manpow.,37, 1042–1066 (2016) 38. Zammitti A, Russo A, Magnano P, Guarnera M. Work Engagement as a Moderating Factor between Positive Attitude toward Smart Working and Job and Life Satisfaction. European Journal of Investigation in Health, Psychology and Education 12(7):781-791 (2022)

39. Gajendran, R. S., & Harrison, D. A.: The good, the bad, and the unknown about telecommuting: meta-analysis of psychological mediators and individual consequences. Journal of applied psychology, 92(6), 1524 (2007)

40. De Menezes, L. M., & Kelliher, C.: "Flexible working and performance: A systematic review of the evidence for a business case". International Journal of Management Reviews, 13(4), 452-474 (2011)

41. Grzywacz, J. G., Butler, A. B., & Almeida, D. M.: Work, family, and health: Work-family balance as a protective factor against stresses of daily life (2008) 42. Allen, T. D., Herst, D. E., Bruck, C. S., & Sutton, M.: "Consequences associated with work-to-family conflict: a review and agenda for future research". Journal of occupational health psychology, 5(2), 278 (2000)

43. Allen, T. D., Johnson, R. C., Kiburz, K. M., & Shockley, K. M.: Work–family conflict and flexible work arrangements: Deconstructing flexibility. Personnel psychology, 66(2), 345-376 (2013)
44. Hill, E. J., Erickson, J. J., Holmes, E. K., & Ferris, M.: "Workplace flexibility, work hours, and work-life conflict: finding an extra day or two". Journal of Family Psychology, 24(3), 349 (2010)
45. Allen, T. D., Golden, T. D., & Shockley, K. M.: "How effective is telecommuting? Assessing the status of our scientific findings". Psychological science in the public interest, 16(2), 40-68 (2015)
46. Di Tecco C, Ronchetti M, Russo S, Ghelli M, Rondinone BM, Persechino B, Iavicoli S.: Implementing Smart Working in Public Administration: a follow up study. Med Lav, 112(2):141-52 (2021)

47. Hartig, T., Kylin, C., & Johansson, G.: "The telework tradeoff: Stress mitigation vs. constrained restoration". Applied Psychology, 56(2), 231-253 (2007) 48. Sardeshmukh, S. R., Sharma, D., & Golden, T. D.: Impact of telework on exhaustion and job engagement: A job demands and job resources model. New Technology, Work and Employment, 27(3), 193-207 (2012)

49. Caillier, J. G.: The impact of teleworking on work motivation in a US federal government agency. The American Review of Public Administration, 42(4), 461-480 (2012)
50. Bartel, C. A., Wrzesniewski, A., & Wiesenfeld, B. M.: Knowing where you stand: Physical isolation, perceived respect, and organizational identification among virtual employees. Organization Science, 23(3), 743-757 (2012)
51. Bednar, P. M., & Welch, C.: Socio-Technical Perspectives on SW: Creating Meaningful and Sustainable Systems. Information Systems Frontiers, 22(2), 281–298 (2020)
52. Blom, M., & Alvesson, M.: Leadership on demand: Followers as initiators and inhibitors of managerial leadership. Scandinavian Journal of Management, 30(3), 344-357 (2014)
53. Mumford, E.: The study of socio-technical design: Reflections on its successes, failures and potential. Information Systems Journal, 16, 4, 317–342 (2006) 54. Ekman, P., Brattesani, K. A., O'Sullivan, M., & Friesen, W. V.: Does image size affect judgments (1979)