"Wellbeing and Smart Working in the new industry era"

Popolo V. *, Di Nardo M.*, Di Leo R.,**

De Cristofaro A.,De Nino M. *****

**Dipartimento di Ingegneria Chimica dei Materiali e della Produzione Industriale,University of Naples "Federico II", Via Piazzale Tecchio 80,– Napoli – Italy (valentina.popolo@unina.it,mario.dinardo@unina.it)*

** freelance researcher (renatadileo@tiscali.it, *decristofaroant@alice.it)*

****Dipartimento di Scienze e Tecnologie, University of Naples "Partheonope", Centro Direzionale isola C4– Napoli – Italy (maurizio.denino@uniparthenope.it)*

Abstract: The increasing development of new technologies, involving everyday life, drives innovation and new applications, and needs ever-growing skills. In the new era, the workplace and organization processes interact and modify themselves continuously. However, in the workplace, several generations of workers will coexist, and it is essential to manage the sharing of their skills and their experience. The new digital era requires that organizations be less hierarchical and more streamlined, with greater involvement of workers about activities and processes. The classic workplace is changing new conditions are growing up. In the new industrial and digital era, the work will become more adaptable to skills and aimed at the immediate achievement of objectives, as it is more based on the network and interconnectivity. The work will be mobile, no longer located in space and time, and collaboration between colleagues will take place mainly through the network. The socio-economic condition is continuously evolving, changing the everyday work and bringing enormous benefits for both companies and the workers themselves. This paper focuses mainly on Public Sector and highlights how digital and Technology can best support people in the workplace, improve their performances and reduce the problems about the artistic aspects of the job, and create opportunities for companies, workers, and society.

Keywords: Ergonomy, Telework, Smart Working, Wellbeing, Industry 4.0.

1.Introduction

The work has changed, over time, from a ~~purely~~ work in a physical place, where presence was fundamental, up to, thanks to digitalization and Technology, remote work. The recent pandemic problems have provided a reactive boost to the extensive use of alternative forms of work in the presence. However, remote work has already been present for some time throughout Europe and in the world. Teleworking was born in the USA (simultaneously in Scandinavia) in the seventies with Jack Nilles, who was considered his father. Nilles created the terms "telecommuting", interpreted as the possibility of "bringing work to workers rather than workers at work", and "telework", that is, "any form of replacement of business trips with information technologies. Hence Teleworking uses IT operations and communication to allow a different separated work position (Baruch, 2001). Telework allows us to increase labor productivity, considering that there is no work interruption, and even if there is no communication face-to-face (Kazekami, 2020). The new approach is very suitable for managers who appreciate the flexibility and the use of new technologies to support it (Silva-C, A, et al.2019). At the same way, the use of more and more sophisticated technologies lets new risks and problems connected to the remote work arise up (Podgorsky, A. et al., 2017). The different problems are focused up also in the Public Sector, although the essential advantages, isolation is a problem to be underlined (de Vries, et al. 2019). This flexible working methodology has evolved into Smart Working.

In Italy, Smart Working is a present concept more and more used, so it was regulated in 2017 with the Agile work law. It produced a precise regulation that defines the Smart Working in all its legal aspects, including the rights of the smart worker and control by the employer, technological tools and methods with which the activity is performed remotely. Smart working becomes a method of execution of the subordinate employment relationship, established by agreement between the parties, also with forms of organization by phases, cycles and objectives and without specific constraints time or place of work, with the possible use of technological tools to carry out the work activity (Harvard Business Review,2015). The approval of the law was a stimulus to the activation of initiatives more for the public sector than for the private sector: 60% of Public Administrations (PAs) with structured projects indicate the introduction of legislation as a stimulus, compared to 17% of large companies and 17% of Small Medium Enterprises (SMEs). Smart Working is a phenomenon of considerable interest also within the European panorama. In this regard,

mention should be made of the resolution of the European Parliament of 13 September 2016 aimed at defining labor market conditions aimed at promoting the balance between private and professional life (Alessandrini, G. 2016a). This document shows that the European Parliament supports and encourages Agile Work in all its forms of application. This study is contextualized on the use of Technology to get wellbeing in the context of smart working. Technology, as aforesaid, can increase productivity even if there are problems connected to it. In particular, we will discuss on benefits of Technology on the wellbeing. In fact, it will be shown how some workers' problems may be alleviated by reproducing a familiar working environment in a different physical place from everyday life. The analysis is conducted through data available in the databases analyzed. The remainder of this paper is organized as follows. In the second Section, it reviews the most relevant studies from the literature, and the work organization is presented. The applications and new tools for the new work organization are presented in Section 3. Section 4 presents the results of a numerical study, and Section 5 draws a final results analysis. Finally, the work concludes with suggestions and future research directions.

2. A work cultural changing

Smart working is a profound cultural change about the organizational model of both public and private working realities, providing for the rethinking of the ways that characterize work, not only outside, but also within the company (Alessandrini, 2016b). This organizational contingency also affects the management of spaces, which must be designed, taking into account the principles of flexibility, virtualization, the collaboration between people. In this perspective, the open spaces, coworking spaces, and fab labs have to be considered (Maitland, 2014). It should be noted the difference between teleworking and smart working. While in the teleworking, the employee is obliged to work from a fixed and pre-established position, with the related he needs to keep the same hours that he would have in the office, in the smart working, the worker does not need for a fixed location consequently. The constraints of space and time are non-existent (Bollier, 2016). The only real constraint has represented the achievement of objectives and results.

Therefore remote working allows to: attract and therefore retain the best talent, increase employee satisfaction, save staff time and money, continue working, maintain high productivity, smart working allows excellent flexibility. The use of remote working, and the objective flexibility it entails, as well as mobile devices, allows an incredible gain in terms of competitiveness, at least in theory. Italy is lagging behind the rest of Europe, although teleworkers increased by 8%. From an organizational point of view, the advantages of teleworking include reduced costs, a decrease in absenteeism and employee turnover, an increase in employee morale, and an increase in productivity related to the ability to access a larger pool of employees as a geographical area. (Degryse, 2016).

In this context, Technology plays a primary role. Smart Working and Digital Transformation follow a parallel procedure: on the one hand, Smart Working needs technologies to implement its practices and models, on the other hand, it represents an excellent lever for the creation of Digital Public Administration. Focal points of the interaction between the aforementioned components are:

- Social collaboration: tools and services that allow us to communicate and relate, creating new opportunities for collaboration and knowledge sharing.
- Mobility: Platforms and applications that support mobile work.
- Security: Technologies created to guarantee data security, even remotely, and from various devices.
- Workspace Technology: Technologies and services for more flexible and more effective use of physical environments.

Therefore, smart working constitutes an essential element of innovation in the Public Administration allows you to go beyond mere fulfillment, promoting collaboration, programming, management, and results.

The *Smart Worker* is the individual who works in a very different way compared to a permanent past: he works where he wants and where he is needed, has no fixed hours, using IT tools to carry out his business anywhere. The Smart Organization is the corporate organization designed to increase the number of people connected and involved, to bring processes beyond geographical borders and often beyond the companies themselves. "Smart work" increases productivity (Cardona,2015). In Italy, tools and organizational models are going to be implemented by using Mobile & Smart Working. Hence the focal points of this methodology are:

- a definite improvement in the balance between private life and work (78%);
- a higher motivation; a decrease in absences; a better internal climate; more productivity; greater involvement;
- less time lost in traffic; a better relationship between work and quality of life; having the opportunity to look after your children;
- having the opportunity to live where you prefer, rather than being forced to live in a specific area around the office (in the case of Yahoo, it is Silicon Valley or in large cities), sometimes quite expensive.

With the changing needs of remote working, new forms of communication must necessarily be developed. The term

Unified Communication and Collaboration (UC&C) identifies all forms of communication which, starting from an original format and device, are transferred to other users of the communication in the original format or another format, and on a device similar to the original one or even completely different. Among the new technologies, we find Internet Protocol Television (IPT), digital signage, and virtual / 3D collaboration. Today, the smartphone, tablets, etc. allow a significant interaction in everyday life. According to the study conducted by Lenovo (Corvi, 2019), smart technologies have transformed jobs, and the sample analyzed believes that Technology is already helping to create more different inclusive and open work environments for different types of people. The research, conducted on a sample of over 15,000 people in several countries such as Brazil, China, France, Germany, Japan, India, Italy, Mexico, the United Kingdom, and the United States shows the inclination trend to innovation. It emerges the people interviewed believe that smart devices allow them to save at least 30 minutes a day, citing the speed with which they allow them to manage their work duties, connect to colleagues. The new generation of workers expects more flexible working methods to be always tuned and connected.

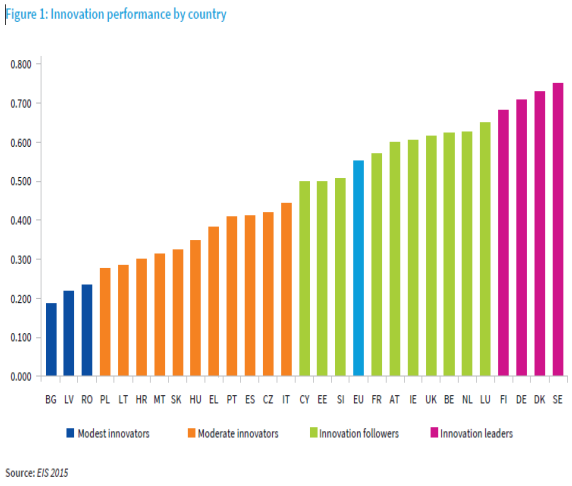

Figure 1: Innovation performance by country. EIS2015

Nowadays, the progress of technology, such as artificial intelligence and machine learning and the way things are made, such as robotics, nanotechnology, and biotechnology, will make the reality of the work universe change considerably (Biewald, (2015). The only way to manage this universe in progress is to be found ready for any technological innovation. Among the most popular methodologies, aimed at a continuous interaction between network, Technology, and work approach, we can introduce the Digital Journey, which consists of 5 fundamental steps:

• Learning: use of the network as the primary information source and ability to shape communication channels based on users'needs.

• Sharing: Importance of comparison and cooperation. The opinions, advice, and shares help orient us among the possible choices, choosing those that save us time and are an investment for our health.

• Creating: not only content care but also creation, which underlines the importance of the individual creative ability.

• Networking: single ideas spread and merge with common ones. From the islands, we go to the network. Sharing stimulates contact, knowledge, co-creation. In turn, networking generates value.

• Experimenting: It is necessary to "go out" to experiment and engage - in this case, feeling the so-called emerging Technology with your hand. (Maestri, 2018).

3. Work organization

Organizing work, with the advent of industry 4.0 and, therefore, with references to innovation, becomes one of the priority activities to be managed by employers and managers. Efficient performance and production should be reconciled with workers' wellbeing, which is why it is essential to rethink and contextualize organizational and economic models. This paper also aims to indicate an overview of these links and the primary forms of innovative organizations to offer the advantages (Bolognini et al., .2012). In this way, it will be possible to base the need to invest in innovative organizational models in the context of Industry 4.0. The new organization and innovation practices include various practices that would be difficult to detail, such as the so-called High-Performance Work Practices (HPWP) to improve operator efficiency and to increase their collaboration and individual performance with the aim of a return in terms of profits and productivity (Cisco, 2016).

Another essential condition for a good work organization is represented by training, to ensure a broader and pertinent knowledge inherent to the specific tasks of the worker. Classical training methods have followed the typical logic of game simulation motivation and implement more innovative communication models. The use of simulation in different Management area shows workers' wellbeing levels and attention are increasing (Di Nardo et al. , 2015).

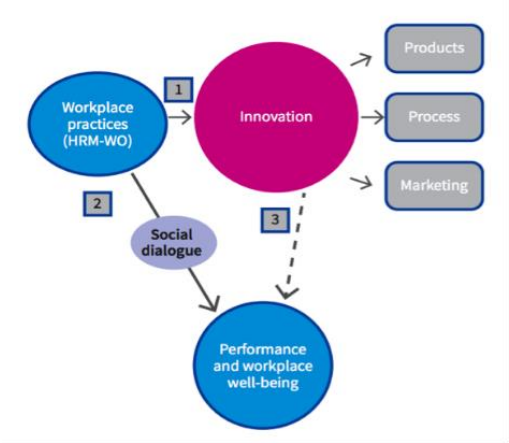

Figure 2: Eurofound, Innovative changes in European companies: Evidence from the European Company Survey, Publications Office of the European Union, 2017

Figure 2 shows the links between the work organization, the different forms of innovation, and workers' wellbeing.

3.1 Health impact

In recent years, the workspace has been redesigned. There is no division between workplace or other space, both public and private, for example, a worker can work in one or more locations. A worker and his colleagues can be in one physical space or collaborate with colleagues who are dispersed in many locations, which could be regional, national, European, or international. ICT allows people to communicate and exchange documents and information without necessarily having to be located in the same place. This reduces the need for people to travel to attend meetings in person, which reduces exposure to the risks associated with travel. Therefore, the job can now be placed anywhere. The use of ICT can provide some benefits, primarily by removing people from dangerous environments (Dolphin, 2015). Workers can also be protected by automating dangerous tasks; for example, drones can be used to avoid height or other hazardous environments. Flexible working models, enabled by ICT, can contribute to wellbeing at work and allow people to juggle work and private life. In this study, the strengths have been emphasized, without forgetting the question that even the European Agency for Occupational safety arises. What will be the new and emerging risks associated with the use of new employment models fundamentally linked to the use of Technology?

A study that the Agency has carried out has tried to forecast over a period that lasts until 2025, analyzing in detail specific technologies such as computing power or quantum computing, or exposure times and possible risks. It is essential to analyze possible health risks, with adequate training on the subject they can guarantee us a more excellent knowledge of the dangers and risks to which we are exposed by trying to implement preventive strategies (Working report EU-OSHA). The new Industry era improves the studies regarding the human-machine interface (Di Nardo et al., 2020), to reduce the probability that a worker may make an error due to the lack of knowledge or competence. Industry 4.0 defines the new needs for productivity and production efficiency, which inevitably also affect operators. A traditional operator is transformed into Operator 4.0 (Madonna et al., 2019). There are many ways to improve the worker's physical, sensing, and cognitive abilities, such as legacy systems, predictive maintenance, and the machine-people interaction system based on the operator's position. In this scenario, we can feel calm, as the different sectors are outlining a scenario from which the strengths of a work reorganization based on ICT can be seen, and at the same time, studies are being carried out on conducted methods that make sure to minimize risk exposure.

To conclude, some researches demonstrate how the use of forms of work, such as teleworking, can only guarantee a benefit also for the environment. For example, in Switzerland, urban planners and policymakers have always investigated the various actions that could alleviate traffic congestion and improve air quality. A study conducted found that teleworking reduced traffic by an average of 2.7 percent. According to the instrumental variable (IV) telework, it reduces air pollution by 2.6–4.1 percent, also reporting a response worthy of analysis. Therefore, if there is a correlation between pollution reduction, energy saving, worker and citizen wellbeing, and the reorganization of ICT-supported work, it is advisable to prepare new study channels that favor an ever-increasing improvement of the proposed study topic.

4. Applications and Tools that Enhance Employee Wellbeing

In recent years, many digital healthcare apps have been introduced to help Human Resource (HR) officials manage the health and wellbeingwell-being of employees. This new trend into wellness care is not only designed to deliver benefits for employees, but also employers. More wellbeing apps use virtual reality (VR) and augmented reality (AR). VR and AR are having a significant impact on the healthcare industry and is now expanding into other areas of everyday life.

AXA Hong Kong, The Chinese University of Hong Kong (CUHK) and Oxford VR (OVR) announced the first-of-a-kind partnership to pilot an innovative automated and immersive therapy using virtual reality for mental health in Asia. The pilot focuses on a modern VR technology platform for managing common mental health issues, such as social avoidance, anxiety, and depressive symptoms, in people's daily lives and work. At these problems as isolation described above can be added in a smart working modality. Businesses in Spain have started to sign up Psious, a virtual and augmented reality technology company that has developed ways to use VR and AR to help mental health and behavioral issues from phobias to anxiety disorders. Many apps and online services have launched to help workers manage their mental and physical health. Stress,

anxiety, and depression are the most common reasons for taking a day off.

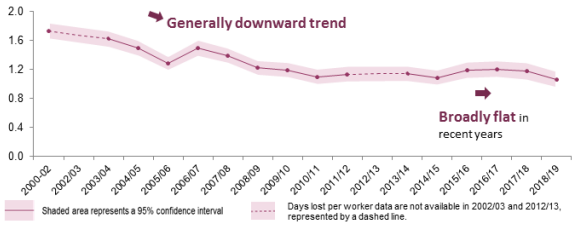

Figure 3: Working days lost in Great Britain due to work-related ill health and workplace injuries (from Health and Safety Executive)

For example, in Great Britain, stress, depression, or anxiety are accounted for the majority of days lost due to work-related ill health, 12.8 million and 6.9 million, respectively. On average, each person suffering took around 15.1 days off work. This varies as follows:

- 8.1 days for Injuries
- 17.3 days for Ill-health cases
- 21.2 days for stress, depression or anxiety
- 13.8 days for Musculoskeletal disorders

In Pisa (Italy), a regional project, using the VR, is running to prevent and rehabilitate work-related stress damage. The project is a partnership between Inail, Regione Toscana, and the University of Pisa.
The project uses some specific virtual scene to improve the resistance to stress with the concept that lives a stressful condition in a controlled and safe environment to reduce vulnerability.

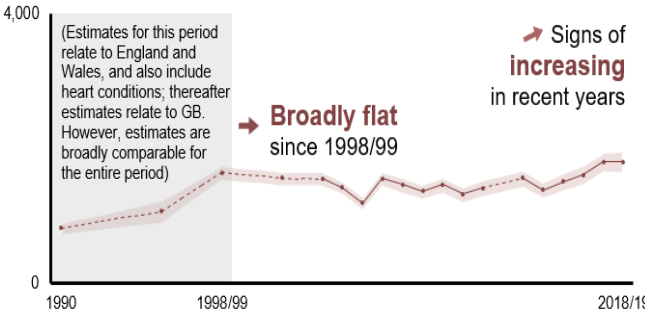

Figure 4: Rate of self-reported stress, depression, or anxiety, the estimated rate per 100.000 workers in GB, 2019 (from Health and Safety Executive).

5. Experimentation

There are different aspects of employee wellbeing and different tools and applications based on VR and AR to enhance it. Considering that the anxiety is common in the general population and also among workers (affecting their performance) and that virtual reality (VR) devices could alleviate anxiety pressures, by immersing the workers in an interactive synthetic working environment in a physically different place, we developed a dedicated study on this topic.
The study was conducted on 20 participants divided into two groups: one experimental (VR) group and the other a reference (REF) group. All participants first completed initial depression anxiety and stress scale (DASS-21) and a social trait anxiety inventory (STAI-Y) scale to assess the anxiety-stress levels. The participants were randomly allocated into either the VR experimental or REF group.
Both groups were immersed in a virtual scenario simultaneously and using the same type of device. The VR group has followed a training session on marketing in a relaxed scenario of Maldive, and the REF group followed the same training session but in a typical conference room scenario.
The training session was 2 hours long, with a break of 10 minutes after 55 minutes. The break was always done in the virtual environment.
After the experience, the STAI-Y was again administrated, and an additional questionnaire was submitted.

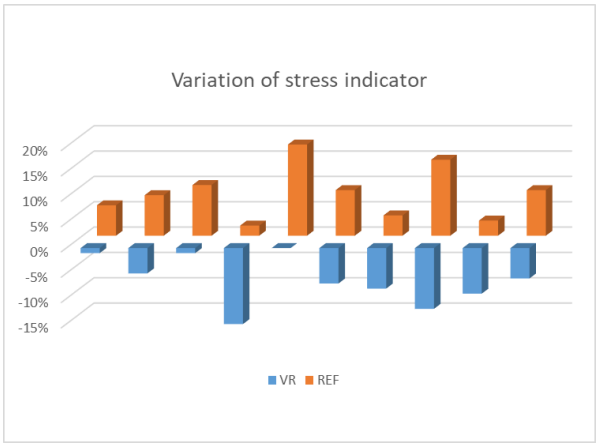

Figure 5: Variation of stress indicator for both VR and REF group

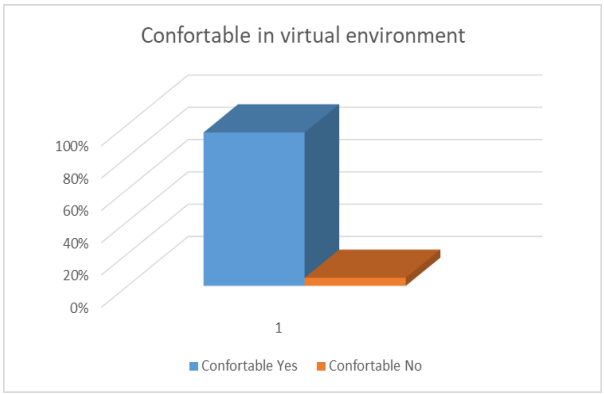

Figure 6: Percentage of participants that had a comfortable experience using the VR

The results show a significant difference between the VR and the REF groups, with highly significant reductions in stress levels being associated with the VR group. The analysis of the submitted questionnaire shows that

participants enjoyed the Maldive experience, felt more relaxed after using the application, and responded favorably to using virtual reality for relaxation at work and combining relaxing virtual environments with work-related activities in a smartworking way.

6. Conclusion

The smart working and teleworking are more and more used with all benefits and relative critical aspects. Work-related stress and depression are becoming a significant concern at the workplace and a significant factor in decreased productivity amongst office workers. In years the use of Technology has developed new working forms. Smart working allows employees to increase productivity (Tiraboschi, 2016). The use of Technology encourages remote control and instructions.

Anyway, new applications like VR and AR are becoming a new form of stress management that could be deployed, allowing workers to create a different relaxing working environment in a different place. The union between new technologies and psychology is now a reality. The Technology of VR was previously only used by psychotherapists to treat patients, but now it sells to corporate departments of human resources as a tool to combat stress and the pressure in the workplace. The study demonstrated that anxiety levels could be reduced significantly through the use of Technology. Further studies need to be done with a more significant number of workers and different scenarios, investigating the equipment quality and possible application to other mental health areas and the different community groups. Combining smart working and new technologies increase the workers' performance and reduce stress and anxiety.

Smart working could be used to prevent the danger of the progressive spread of epidemics to reduce risks in crowded areas to ensure adequate service levels. Furthermore, it is possible to make considerations also after the recent pandemic lockdown that unexpectedly involved everyone and everything, including work. The use of Smart Working was among the first preventive actions to be put in place, not only in the areas massively affected by the epidemic but also throughout the national and international territory. It has become the most adopted working method to minimize the possibility of contagion, to reduce risks, mitigating inconvenience, and contending the enormous economic damages and social issues that this emergency is likely to cause. Constant monitoring is in progress regarding the application and possible organizational improvements encouraged by this way of working. We witnessed a sort of test, which in part has already made us understand how concepts that until now were, for the most part theoretical, today they become the pivot for a future that supports smart working as a solution to be activated in the ordinary rather than in the extraordinary conditions.

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