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Artificial Intelligence for Risk Assessment in Hybrid Workplace and Flexible Work

Giuditta Simoncelli[1], Laura De Angelis[1], Emma Pietrafesa[2], Raffaele Mariconte[1], Agnese Martini[2], and Claudia Giliberti[1]

[1]INAIL- Department of Technological Innovations and Safety of Plants, Products and Anthropic. Settlements. Italian Workers' Compensation Authority (INAIL), 00143 Rome, Italy
[2]INAIL- Department of Occupational and Environmental Medicine, Epidemiology and Hygiene, Italian Workers' Compensation Authority (INAIL), 00143 Rome, Italy

ABSTRACT

The COVID-19 pandemic has encouraged the spread of remote working as an instrument to prevent the stop of work activities. Resilience has led to the adaptation of the existing work models into hybrid ones, enabling many companies to test new forms of organisation. This has led to critical issues, particularly in the management of the health and safety at work and in the sustainability of production processes, due to the contradictions in these areas, in the European legislation. At now, it is still difficult to obtain an overall framework of effects and possible risks of hybrid workplaces. In fact, in addition to traditional risks, new risks and unexplored interaction between risks and human factor are emerging. Furthermore, it highlights the need to rethink new reference figures in the safety management system. However, the benefits of increased productivity, work life balance, sustainability and environmental impact are clear. The aim of this research is to rationalize the technical knowledge and the case studies of possible risks related to hybrid workplace, in order to support the worker and the employer in the analysis of hazards and risk assessment, risk communication and prevention, through a dynamic assessment system based on Artificial Intelligence (AI). For this purpose, the current legislation has to be investigated, identifying technological solutions useful to fill some gaps for an extension of protection in new forms of remote work.

Keywords: Artificial intelligence, Occupational health and safety, Remote working, Hybrid workplace language

INTRODUCTION

Because to the COVID-19 pandemic, many people were able to experiment with remote working, primarily from their homes, using information technology and network connections. This condition led to the expansion of this method of employment into professions that didn't previously require labour tasks outside of the typical workplace. Before the emergency, the deployment was limited to some Northern European countries and represented a limited experience in the others. The experience with Covid-19 has changed society's

approach to work while technology has allowed occupations to be rethought remotely through a process of resilience too. The pandemic situation also enabled spontaneous experimentation of new ways of thinking about work which integrate spatiotemporal, technological and socio-cultural dimensions of life and organisation (Aroles et al., 2021).

In the European Union there is no universal and unambiguous definition of remote working, which is regulated according to the local legal frameworks, with heterogeneous terminologies and legislations (Baruch, 2001; Parry et al., 2021). In this article "remote working" refers to working modes which include, according to Italian legislation, "teleworking", "smart working" and its natural evolution into "hybrid working".

Teleworking is meant as a form of remote work in which the job is performed at a fixed location chosen and formally notified by the worker outside the usual workstation provided by the employer, through the support of the ICT devices, needed for the instrumental and functional interconnection between the workers and the employers themselves. According to the occupational health and safety (OSH) regulations, the employer is responsible for the delocalised workstation and the worker is required to observe the same working time as the others in the usual workplaces.

Smart working is meant as an executive mode of a subordinate work, performed outside the usual work environment provided by the employers, in different places which don't need to be preventively notified to the employer; the work process is essentially based on the achievement of agreed results/objectives, therefore the worker is granted of full organizational autonomy, even about the work schedule and time (Martone, 2018). *The Smart working mode* requires a written agreement between the parties, defining the performance of work. Both the worker and the employer are involved and cooperate in the working safety management, while the employer is responsible for the security and the maintenance of the used devices.

Hybrid working is improperly meant as an alternation and combination between on-site and in-presence work: actually, both the Teleworking and Smart working modes are already involved in such interchange. The hybridity, instead, concerns the plurality of environments in which job activity is performed, the extension of remote working to sectors not covered by the original regulations and the profound influence that remobilization has exerted on the market and the organization of salaried work, assimilating certain job modes of self-employment.

In particular, the hybridity concerns the adoption of typical forms of flexible and self-employed work into the modes of employment and the plurality of working environments, in the transversal and dynamic conception of risk, with important consequences for OSH and the need to adapt legislation to the new needs of prevention.

CRITICAL ASPECTS OF LEGISLATION AND THE POTENTIAL OF ARTIFICIAL INTELLI-GENCE TO SUPPORT THE OCCUPATIONAL HEALTH AND SAFETY

The Italian legislation on OSH is based on the fixed relationship between time, space and the nature of job performance (Brunetta & Tiraboschi, 2021),

a definition actually overtaken by the technological devices through the idea of infosphere (Toffler, 1987), as a dimension which combines the mentioned categories (time, space, type of performance) into a network of ceaseless connections. While it is true that technology can help the employer to monitor the risk aspects to which the worker is exposed, the protection of privacy and the potential illegitimate remote control of the worker place substantial limits on the way technology is programmed and used, especially in the context of the potential of artificial intelligence (AI).

In this sense, research in OSH field, on the one hand focuses on the study and realisation of innovative products to support risk prevention, and on the other has a synthesis role to play in balancing the potential of new technologies with the protections and rights of workers. According to existing studies it is still difficult to obtain an overall picture of the effects and the hazards concerning the remote working. Such studies have significantly increased during and following the pandemic, but they are fragmentary and concentrated in the European countries (Athanasiadou & Theriou, 2021). However it's interesting to note that the statement of remote working caused by the extraordinary adaptation during the emergency resulted in finding new fields of research: management and organization of the remote working; changes within the labour market; new professional skills and opportunities; occupational health and safety (emerging risks); effects on the social and personal relationships, on the gender distinctions and on the boundary between personal life and worktime; impact over environmental and energy policies (Majid et al. 2020); impact on the digital divide (Sostero et al., 2020). In Italy, the occupational health and safety is regulated by the Legislative Decree n.81/2008, known as "Consolidated law on Safety at work", and its further integrations and amendments, which states that employer is responsible for every aspect of the workers' protection, sharing this responsibility with third actors in charge of safety, such as the competent doctor. The obligation of the employer to provide workers with information about the hazards and protective measures related to their jobs and the workplace is one of the key elements of OSH law.

In this regard, the Consolidated Law establishes, depending on the individual activities, both a general training and a specific training on a specific risk.

The fundamentals of OSH are covered in general training, including the notion of risk, damage, prevention, protection, organisation of company prevention, rights and duties of the various company actors, supervisory bodies, monitoring and assistance. The specific training must be of a duration related to the degree of risk of the job activity and environment (low, medium, high) and concerns the specific risks related to the tasks, the potential possible damage and prevention and protection measures. In Smart working, the worker having autonomy in choosing the working environment, cooperates with the employer in detecting the risks, through the implementation of the information note that the employer issues on the general and specific risks of smart working. However the extreme variability of environments, both indoor and outdoor, where the workers can perform their tasks, results in a high variability of the risks as well, which would require a deeper training about specific

risks, while such kind of training is usually provided by professional trainers specialized on a particular type of risk.

In agile work, the worker, having autonomy in choosing the working environment, cooperates with the employer in identifying the risk through the implementation of the information that the employer issues on the general and specific risks of agile work. However, the plurality of indoor and outdoor environments in which the worker may perform, entails a dynamic nature of the risk that would presuppose in-depth training on the specific risks that is generally the domain of professional figures specialised in the individual risk.

Technology, and the computing capacity of artificial intelligence, can support the worker in evaluating the dynamic assessment of the specific risk, leading the choice of the correct behaviour to implement in the event of danger and integrate the employer's information in an intelligent form.

In this sense, the researchers of Inail, the National Institute for Insurance against Accidents at Work, (a public non-profit entity safeguarding workers against physical injuries and occupational diseases) are realising an AI-based virtual assistant that dialogues with the worker and the subjects involved in the participatory OSH process, in order to map the work environment, supporting the experience skills and integrating the information note that is an integral part of the agreement where remote work modes are regulated, for the purpose of an instantaneous risk assessment. It is therefore a type of automated and intelligent reporting note.

AI-BASED VIRTUAL ASSISTANT FOR INTELLIGENT RISK ASSESTMENT

The main goal of the research is to get a dynamic risk assessment system, based on AI technology, which provides an integration between a centralized "static" database (continuously updated and focused on categorizing typing the possible environments, risks, tools, preventive and protective measures) and a "dynamic" database, which collects the needed info, guided by the virtual assistant, about the work environment and any significant health conditions from the workers, who would be guided by the virtual assistant. On the server side the software will have to process the data provided by workers, relating them to the typified data contained in the centralized database, to inform the workers about specific risks they're exposed to, and about the preventive measures required to contain and minimize them; the specific risk conditions identified by the software should be registered within the "dynamic" database and made accessible to the various actors involved in the health and safety issues, who may in turn interact, by integrating the recommended actions on the bases of their own specific expertise. The software life cycle should be set to be integrated with the suggestions and critical issues found by the actors involved in the safety management; especially the competent doctors can contribute to the integration and updating of the centralized "static" database, where the researchers are systematizing the case histories of the possible risks, referable to the different indoor and outdoor environments, in

order to support the worker in analyzing the dangers and in assessing, communicating and preventing the risk. Another required feature of the software is the ability to provide the workers specific training and information content for the work well-being, through interactive formats. The software should consider the normative constraints concerning the protection of personal data protection and security, and more generally the ICT security issues, especially those related to the data stored and exchanged by the involved actors and systems. The software design and development should match the required principles of explain ability of algorithms, as well as respect the ethical constraints in terms of containing and minimizing the invasiveness of technology in the workers' private life and control. The project has a three-years duration; the involved researchers, in network with some Universities and Hospitals, are subdivided:

- To study and classify the risks and the hybrid workplaces, the existing legislation and the preventive measures, providing the basic information later processed by the AI on the bases of the data willingly provided by the workers;

- To design, develop and test the AI based software, which should be mandatory designed and programmed respecting the legal constraints in using the AI, for the purposes of verifying a proper design and programming which must be respectful of the principles of transparency, liceity, fairness, "privacy by design / by default", consistency and minimization, accuracy, limitation of storage duration, integrity and confidentiality.

The specific goals are scheduled along two-years or three-years duration phases. The research activities are subdivided into operative groups which shall evaluate the validated information in order to organize and categorize the technical knowledges and the categories of possible risks, beginning with the existing scientific literature, the analysis of existing data banks concerning specific risks and the relevant legislation. In this regard the operative units are distributed in: risks assessment in domestic environments; surveys and focus group; databases design and development ; virtual assistant design and development; legal aspects and critical issues; communication flows; preventive systems which could be integrated into the device. Based on the preliminary literature survey of established risks in work activities performed both in domestic environments and other ones, the research is oriented towards categories of 2 emerging risks (overlaying and interferential), and 2 categories of risk factors (plurality of environments and social/digital/economic gap). The experimental activities related to the two research areas will be aimed at measuring the emerging risks and the relationship with the risk factors in these categories that represent part of the 'new' aspects of regulatory investigation in the legal framework.

CONCLUSION

The combination of predictive analysis, sensory input/output coding and automated self-learning capabilities which can be developed in an AI-based assistant, can be a major challenge for the occupational health and safety with a view to a dynamic risk assessment tool and an organisational solution that

assists and connects those responsible for the safety management process, supporting each stakeholder and with a view to shared responsibility and prevention.

The strict requirements of prevention are: information, education and training. In the Smart working context, "information" takes the form of written information note as part of the agreement regulating off-site working arrangements and is the main act of prevention since responsibility for OSH is shared primarily between the employer and the worker, who is responsible for himself.

Therefore, the AI can integrate the information note, making it smart and collaborative, as an active part of the safety management system, capable of capturing the variability of risks within hybrid workplaces.

For this end, it is mandatory to design and develop an ethical system that foresees, even at the the design and programming phase, the technology-related risks, both in terms of transparency of the used algorithms and in terms of compliance with the relevant regulations, in the relationship between machines and informed monitoring of the workers.

In addition, AI-based systems collect a huge amount of even sensitive and personal data of the worker. They are based on predictive and learning models, whereby they can collect digital tracks and trace and profiling user characteristics to a category and/or decision. Therefore, they can lead to erroneous decisions and violate privacy by tracing personal data collected, even automatically by AI, and can be used in a way that is distorted and different from the reasons they were expected to be. Therefore, research must take into account the "principle of precaution" as a mandatory requirement (Barone, 2020) when approaching risks to ensure the sustainability of the use of AI in order to avoid intentional and irreparable damage.

It must be highlighted the respect of the principle of privacy by design (Rota, 2020) for the transparency of algorithms that allows for the identification of the data owner and the responsibility (commissioner and developer) for the detrimental effects on the rights and freedoms of natural persons, due to automation machines. In fact, the context of security can be a pretext for the control of remote workers and the illegitimate evaluation of their performance.

In conclusion, the use of innovative technologies entails a transformation of working methods, tools, and environments, impacting labour regulation and OSH. This leads to an urgent need for new ways of identifying and assessing risk that are consistent with innovation and based on advanced and collaborative technologies, which play an active part in safety and in this sense, research can also contributes to a better definition.

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