

Gamifying Training to Enhance Sustainable Occupational Health and Safety in Waste Treatment Plants: the SOHS project

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SUMMARY

European Municipal Solid Waste Management (MSWM) strategies have shifted towards integrated approaches emphasizing recycling and resource recovery, which has increased the workforce involved. However, this complexity has introduced new Occupational Safety and Health (OSH) risks, evidenced by over 10,000 work accidents reported in Italy from 2018 to 2022. The SOHS (Sustainable Occupational Health and Safety) project aims to address these risks through a comprehensive occupational risk assessment at selected waste treatment plants, the development of a gamified training tool, and the evaluation of its effectiveness across diverse worker groups. By incorporating gamification into training, the project seeks to enhance engagement and improve safety outcomes while addressing individual and psychosocial factors that contribute to workplace hazards. Researchers from multiple institutions are collaborating to create tailored training scenarios that reflect the unique challenges of the waste management sector.

INTRODUCTION

The rate of waste generation is greatly increasing and it represents a big issue all over the world (Kaza et al., 2018). For this reason, the Municipal Solid Waste Management (MSWM) industry is rapidly expanding and the combination of “safe” and “green” becomes increasingly challenging. Workers in this sector engage in tasks that promote resources sustainability and the preservation of the planet, but these activities are often “Dirty, Dangerous and Demeaning” (Gregson et al., 2016). The combined exposure to multiple hazards and waste materials in plants represents an emerging risk. Occupational Safety and Health (OSH) has a remarkable impact on the productivity, environmental and social responsibilities of companies. The evolution of safety training through the integration of digital technologies becomes essential to improve training effectiveness in accident prevention. The SOHS (Sustainable Occupational Health and Safety) project addresses these challenges through a human-centered ergonomic approach to develop a prototype of a gamified safety training tool for workers in 2 case study plants in Italy dealing primarily with plastic and paper recycling (Fig. 1).



Fig. 1: Floor plan of Plant A (left) and Plant B (right).

RESULTS AND DISCUSSIONS

The first plant is based in Brescia province and receives around 55,000 t/y of waste from MSW separate collection. Waste entering the plant is stored and then sorted manually by 16 workers to separate mainly paper and plastic waste. As an average, 30,000 ton of paper EoW is annually recovered. The second plant is based in Parma province and receives almost 70,000 t/y of waste from MSW separate collection. The plant has 3 different lines for wood, plastic and paper wastes. Manual sorting is carried out by 4 workers on plastic and paper waste. Around 2,000 t of wood, 60,000 t of paper and 5,000 t of plastic are recovered every year. Based on the preliminary results of the postural discomfort assessed using the RULA (Rapid Upper Limb Assessment) tool (Gremo et al., in press), it emerged that out of 12 observed workstations, 6 would need investigation and modifications in the short term (3) or even immediately (3). Whereas, workers did not always perceive postural discomfort (N=31, Corlett's body discomfort map, 1995).



Fig. 3: Workers engaged in manual sorting by conveyor belt placed horizontally (left), by conveyor belt placed obliquely (centre) and on the ground (right).

MATERIALS AND METHODS

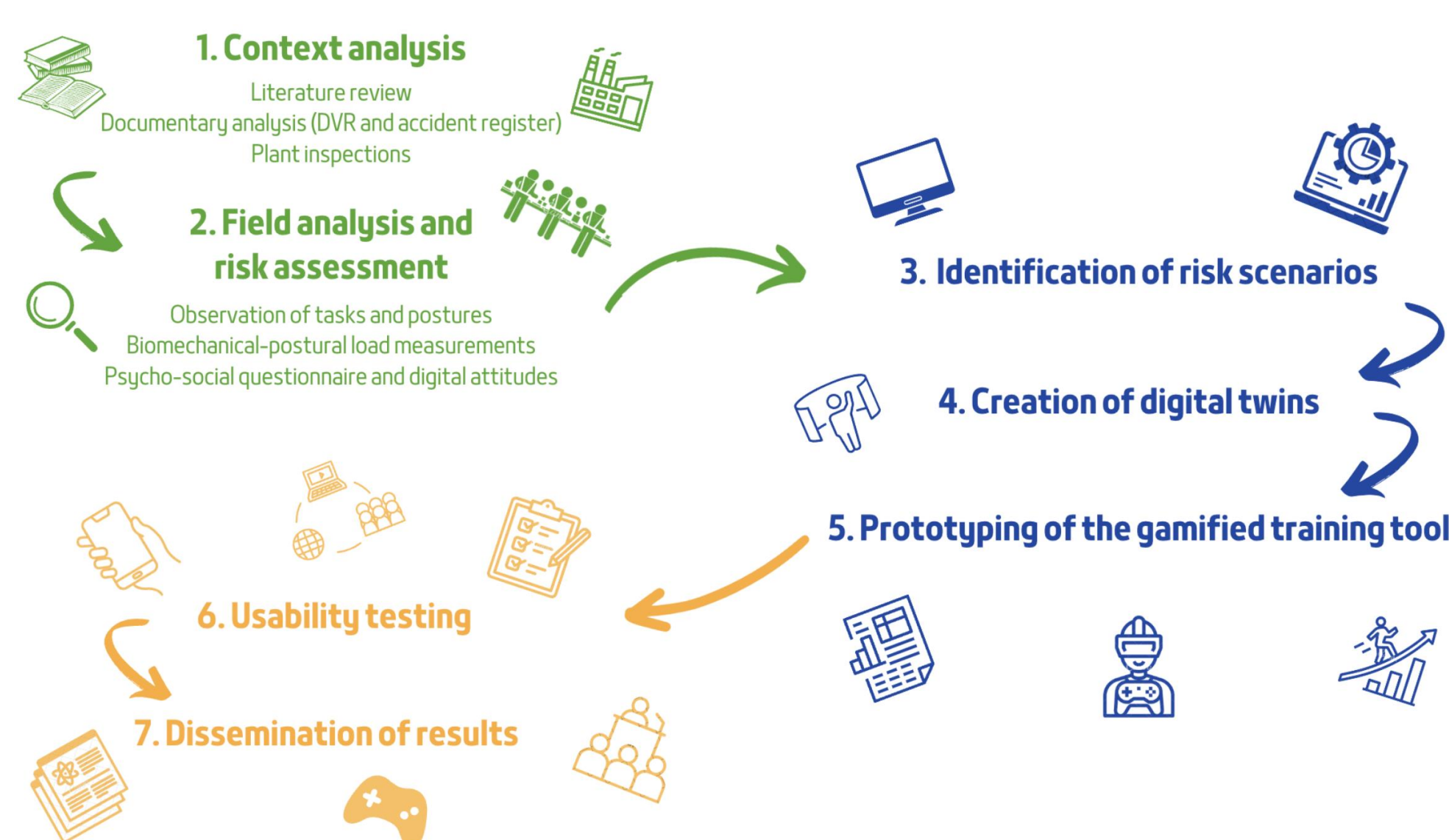


Fig. 2: The seven main phases of the SOHS project.

CONCLUSIONS

The first results of the SOHS project pointed out some discrepancies between observed and self-reported work conditions and behaviors, which will be accounted for in the development of the game scenarios for the prototyped training tool. The usability of the tool will be tested with workers to create a more engaging training experience.

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