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FOREWORD

It is with great pleasure and anticipation that we introduce this distinguished publication, a compilation of innovative ideas and creative insights born out of the International Creative Innovation Idea Competition (ICIIC) 2024.

In an era defined by rapid advancements and global interconnectedness, the need for creative solutions to complex challenges has never been more crucial. The ICIIC serves as a beacon, illuminating the path toward novel ideas that have the potential to reshape industries, societies, and the way we perceive the world around us.

This publication encapsulates the essence of innovation, featuring contributions that span a wide spectrum of disciplines and industries. From cutting-edge technological advancements to socially impactful initiatives, each project showcases the power of human intellect harnessed for the greater good.

We extend our heartfelt gratitude to all the contributors and organizers who have played a pivotal role in bringing this publication to fruition. Your dedication and passion have contributed to the success of the ICIIC, and we are confident that the ideas presented within these pages will inspire others to push the boundaries of what is possible.

May this publication serve as a source of inspiration, fostering continued collaboration and further innovation. Together, let us embark on a journey of discovery and transformation, guided by the profound ideas encapsulated by the ICIIC 2024.

Editors

Chapter 28

WorkEase Assessment App: Enhancing Worker Safety and Health in the Workplace through Comprehensive Assessment

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ABSTRACT

The WorkEase Assessment App has been meticulously designed to evaluate the levels of risk associated with occupational environmental stress, emphasizing enhancing workers' comfort in their workplace. Serving as a robust tool, the application facilitates the calculation and evaluation of the Occupational Environmental Stress Assessment (OESA) Index, providing a user-friendly and direct risk assessment method. This app ensures a seamless, cross-platform experience, catering to mobile phones and desktop computers. Recognizing the significance of understanding occupational environmental stress within a workplace, becomes crucial for maintaining optimal levels of safety and well-being for workers. The workplace environment holds substantial sway over worker performance, productivity, overall health, and safety factors. This significance is underscored by the recent amendment to the Occupational Safety and Health Act 1994 (Act 154) by DOSH, Malaysia, stressing the imperative of conducting risk assessments in all workplaces to prevent adverse effects. Following a successful pilot test within the small welding industry, the app is ready for future implementation in small, micro, and medium-sized industries. This enables these sectors to monitor and track their workers' OESA Index effectively, offering essential documentation for future reference in case of workplace incidents. To further enhance the app's reliability and usability across diverse industries, there is a plan to develop a real-time monitoring device that seamlessly integrates with the app as a future project. At present, the app utilizes various devices to collect physical environmental data for calculating the OESA Index. Ultimately, this innovative approach empowers employers to implement targeted strategies for improving the workplace environment and ensuring workers' safety in a forward-looking manner.

Keywords: Workplace Assessment, Environmental Factors, Safety, Health, Worker.

1. INTRODUCTION

Maintaining workplace comfort is crucial for employee safety and well-being, impacting productivity and performance. Previous research in the metal industry highlights the significant influence of environmental factors on job stress, productivity, performance, and psychological well-being (Balasubramaniam, N.R, 2009). Adverse conditions in manufacturing, including noise, poor lighting, extreme temperatures, and dust, contribute to job-related stress (Ismail, A.R. et. al., 2014). Specific elements like job responsibilities, repetitive tasks, high cognitive demands, and unfavourable environmental conditions are associated with stress or depression (Emin, K., 2007). The impact of temperature stress, noise levels, and lighting on productivity, job performance, and environmental comfort is individually recognized (Yang, W. & Moon, H. J., 2019).

The occupational environmental stress exposure affecting workers in the workplace, especially in manufacturing industries, has a profound impact on their safety and health. Therefore, actions must be taken to calculate, evaluate, and ensure the level of safety and health concerning environmental factors in the workplace. The present innovative product fulfils this objective.

2. LITERATURE REVIEW

Highlighting the significance of a comfortable workplace environment is essential for improving health, safety, and overall performance and productivity for workers. Previous studies explored the influence of environmental stress, specifically noise, on workers' heart rates (Said, M.A.M., Wellun, Z., & Khamis, N.K.,2022). In addition to these investigations, several researchers have explored the impact of individual environmental stress factors on worker satisfaction, health, or productivity (Geng, Y., et. al, 2017). However, there is a limited body of research examining the collective effect of all environmental stress variables on the job performance of workers in the workplace (López-Cabarcos, M. Á., Vázquez-Rodríguez, P., & Quiñoá-Piñeiro, L., 2022).

This current study was carried out in a small-medium metal industry which is the welding industry in Southern Peninsular Malaysia to explore the effects of occupational environmental stress variables among welders. The study specifically evaluates occupational environmental stress by analyzing factors such as temperature, relative humidity, noise, and lighting. A predictive equation named OESA Index was developed using multiple regression and an assessment application has been developed to enhance the level of safety and health among workers in the workplace.

3. METHODOLOGY

The research and development (R&D) employed a comprehensive approach, utilizing a questionnaire survey among welders in small to medium-sized industries and a physical environmental assessment. Post data collection, the application development began, involving the creation of a novel index on the Glide Apps platform. This distinctive index forms the basis for the application's assessment features, ensuring it addresses specific needs and challenges in the welding industry, enhancing its effectiveness in promoting worker safety and well-being.

4. RESULTS & DISCUSSION

4.1. The WorkEase Assessment App

The WorkEase Assessment App offers seamless accessibility through mobile phones and desktops, representing a true cross-platform application. Users can easily log in to the

application using their credentials, regardless of the device they are using. Figure 1 shows the login features, visually representing both the phone and desktop views and showcasing the user-friendly interface designed for convenience and versatility across various platforms.

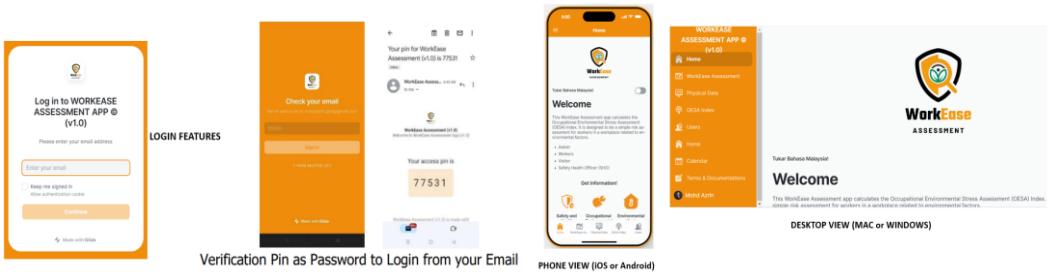

Figure 2: WorkEase Assessment App Preface

Figure 2 illustrates the preface of the Occupational Environmental Stress Assessment (OESA) Index results for workers. After inputting the required data, the app calculates and displays the results. The historical OESA Index values are securely recorded and can be downloaded as a CSV file for future reference or analysis.

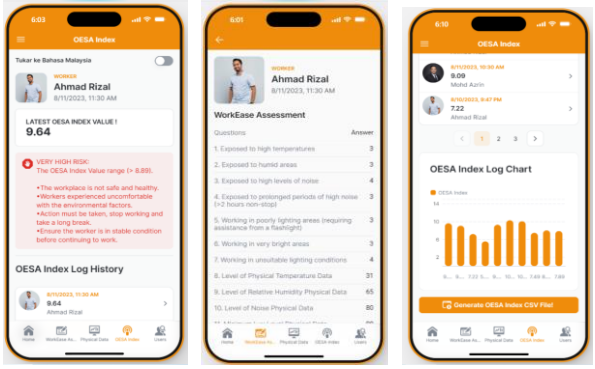

Figure 2: WorkEase Assessment App OESA Index Result

4.2. The Novel OSEA Index Analysis

The Occupational Environmental Stress Assessment (OESA) Index was developed and has been tested to ensure the goodness of fit index model shown in Figure 3 and the level of risk from low risk to very high risk has been established using ROC analysis shown in Figure 4. The index also has been validated with R^2 = 0.7819 shown in Figure 5 and Figure 6 shows user interface and user experience testing results with scores 3.73 up to 4.27.

Chi-Square Test

Frequencies

Comfort

	Observed N	Expected N	Residual
Low RIsk	1	10.5	-9.5
Medium Risk	16	10.5	5.5
High Risk	19	10.5	8.5
Very High Risk	6	10.5	-4.5
Total	42		

Test Statistics

	Comfort
Chi-Square	20.286[a]
df	3
Asymp. Sig.	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.5.

Figure 3: Goodness-of-Fit Index Model

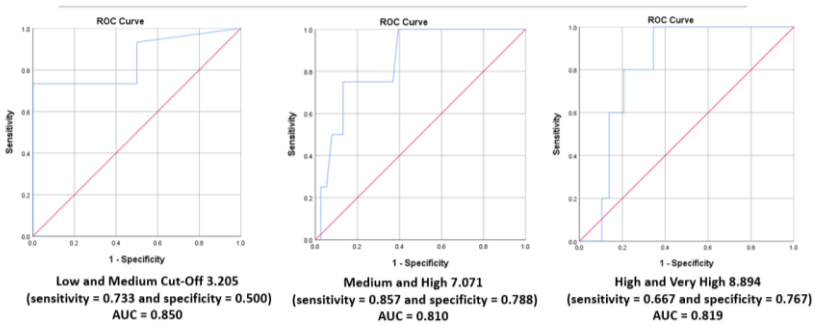

Figure 4: Receiver Operating Characteristic (ROC) Analysis

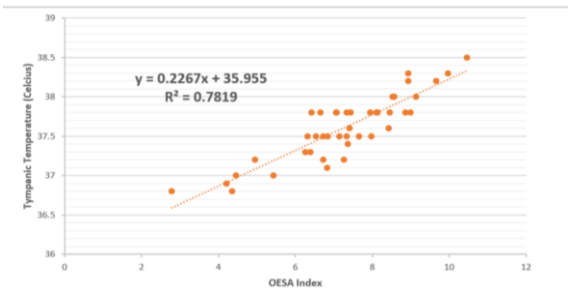

Figure 5: Validity Analysis

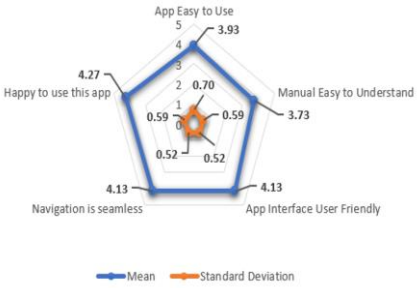

Figure 6: UI/UX Testing

5. CONCLUSION & RECOMMENDATION

The WorkEase Assessment App is a versatile tool designed for a broad range of workplaces, focusing on micro, small, and medium-sized industries. As for now, it has been tested in the welding industry. All features are now implemented, ensuring their effectiveness in assessing and improving workplace safety. Anticipating ongoing development, we plan to add new content and features strategically to address evolving occupational safety needs. Committed to continuous improvement, we proactively refine the app to remain a dynamic and responsive tool. Regular updates aim to fortify its utility, aligning it with changing workplace safety standards for the benefit of workers across diverse industries.

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