

COMPILATION OF **INNOVATIVE IDEA** 2024

IN CONJUNCTION WITH:

**INTERNATIONAL CREATIVE
INNOVATION IDEA COMPETITION**
ICIIC 2024



**MNNF
PUBLISHER**



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2024**

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Published by MNNF Publisher
23-1 Jalan Coco Drive 1,
Taman Bandar Senawang,
70450 Senawang,
Negeri Sembilan, MALAYSIA.

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National Library of Malaysia

e ISBN 978-967-0052-08-3



TABLE OF CONTENT

FOREWORD	i
Chapter 1 Double Head Laser Engraving Machine (DoHLEM) <i>Azman Bin Talib, Norazlina Binti Ahmad, Kamarul Faiz Bin Mihaj, Aiman Muzamer Song Bin Amiruddin Song & Mohamad Hakimi Bin Kamarudin</i>	1
Chapter 2 DPL Interactive Hub <i>Sharipah Khadijah binti S.Hashim, Wan Nor Asniza binti Arshad & Kanchana Kannan</i>	5
Chapter 3 Weather-Based Smart Plant Watering System with Soil Moisture Monitoring <i>Ooi Suan Theng, Cheong Choon Min & Solahuddin Yusuf Fadhlullah</i>	10
Chapter 4 Power Supply Trainer Learning Kit <i>Hafifah Binti Darus, Suraya Binti Abu Seman & Norjuliana Binti Othman</i>	16
Chapter 5 Barretta the Portable Bar <i>Mohd Shafrizal B Md Hassan & Normah Binti Musa</i>	22
Chapter 6 HT T-Hunter for Supporting Blended-Cooperative Learning Environment in Heat Transfer Course <i>Nur Aifaa binti Azman & Muhammad Azri Izani bin Mohamad Halim</i>	30
Chapter 7 Gamification in the Virtual Laboratory: Cultivating Student Engagement and Elevating Learning Outcomes <i>Soon Kok Heng, Charlie Sia Chin Voon & Irene Yang</i>	36
Chapter 8 Digital Logistics Technology (DLT): A Seamless Automated Delivery <i>Abdul Razak Bin Abdul Majid, Shahari Bin Mohd Zin, Dorries Bin Ali, Mohd Syamrie Bin Nazhari & Muhamad Fakharuddin Bin Muhamad Ali</i>	40
Chapter 9 From Textbooks to Tracks: The Educational Benefits of Train Eco Camp <i>Shahari bin Mohd Zin, Muhammad Ibrahim bin Ag Damit, Siti Pazila binti Salleh, Nur Aisya binti Mohd Sabri & Siti Rabihtul Adawiyah binti Mohd Sa'adom</i>	44
Chapter 10 Tungsten Electrode Sharpener Using Hand Grinder Jig <i>Abdul Rahman Mat Abu</i>	50

Chapter 11	
Learning through Immersive and Interactive Mathematics Discovery Platform	56
<i>Irene Yang</i>	
Chapter 12	
The Execution of the Construction Property is Fun (CProFun) Game	61
<i>Fairiz Miza Yop Zain, Norazlin Mat Salleh, Wan Norizan Wan Ismail, Mohd Hafiz Saberi & Mohamad Tajudin Saidin</i>	
Chapter 13	
Interactive Digital Map of MSeKin Wonderland	67
<i>Farah Natasya Binti Zulkifli, Muhamad Zul Khairi Bin Mahadzir & Mohd Mohadir Bin Harun</i>	
Chapter 14	
Enhancing Language Learning in Rural Settings: The SPASS Game Innovation	72
<i>Eric Spencer Benidict</i>	
Chapter 15	
Moveable Charger	77
<i>Habibah binti Remeli</i>	
Chapter 16	
Effectiveness of C Notes and Compiler Apps (Sololearn) on Mechanical Engineering Students in Mastering the Programming Course	83
<i>Habibah binti Remeli</i>	
Chapter 17	
Easy Pissy Writing	89
<i>Moganashwari Kandasamy, Dayang Maheran Bt Ahmad & Kanjana Devi Iyavoo</i>	
Chapter 18	
Wheel of Forecast	94
<i>Irsaedah Binti Abdullah, Ahmad Amin Bin Abdul Rahman & Izan Fahmee Binti Nordin</i>	
Chapter 19	
Fact Finding Booklet V.II: I Am Malaysian	97
<i>Suria Fadhillah Md Pauzi, Musramaini Mustapha, Mohd Firdaus Habib Mohd, Azniza Ahmad Zaini & Shamsinar Rahman</i>	
Chapter 20	
Innovation in The Use of Yagi Antennas with The Speed Test Application by Ookla and Huawei Manager to Improve Students' Understanding in The Topic of Telemetry and Data Acquisition for The DJM30062 Industrial Electronics Course	105
<i>Siti Paridah Binti Juhari & Juliyanna Binti Aliman</i>	
Chapter 21	
Laundry Liberator	112
<i>J.Ramesh & Jini N K</i>	

Chapter 22	
Digitalization of the Selangor State Inspectorate Management System Through Dashboard SP@SEI	117
<i>Mohd Sarngi bin Khalil, Sivapakkiam Ramasamy, Ashotha Krishnan, Nik Hazifah binti Nik Awang@Mat Nawil, Saravanan Bakianathan & Akmal bin Mat Kesumin</i>	
Chapter 23	
Universal Solar Charging System	122
<i>Mohd Amini Bin Ahamad Sayuti, Masliza Binti Maskin & Fauziah Binti Zakaria</i>	
Chapter 24	
SOCO Simplex Legal Pocket V.2: Staying Safe During Holidays	126
<i>Suria Fadhillah Md Pauzi, Mohamad Sahizam Musa, Shamsinar Rahman, Mohd Azim Zainal & Ida Rosnita Ismail</i>	
Chapter 25	
Enhancing Learning Engagement in Introduction to Computer Systems (ICS) through Innovative Integration of Flashcards and Mobile Applications	135
<i>Afzanizam bin Alias & Mohammad Shaufi bin Kambaruddin</i>	
Chapter 26	
Revolutionizing Macroeconomics Education in The Era of Industry 4.0: Embracing Disruptive Technologies for Enhanced Learning Outcomes	139
<i>Nur Naddia Nordin & Nurhaiza Nordin</i>	
Chapter 27	
Smart 3-Wheel Bike: Technical Support for Disabled Entrepreneurs	145
<i>Nur Naddia Nordin, NurHaiza Nordin, Nur Ilyana Amiira Nordin & Nur Faiz Nordin</i>	
Chapter 28	
WorkEase Assessment App: Enhancing Worker Safety and Health in the Workplace through Comprehensive Assessment	151
<i>Mohd Azrin Mohd Said, Nor Kamaliana Khamis, Mohd Anas Mohd Sabri & Ahmad Rasdan Ismail</i>	
Chapter 29	
Smart System for Detecting and Monitoring Alcohol Content to Workers in The Commercial Transportation Sector	156
<i>Myia Yuzrina Zalkis Ayol, Mohamad Anas Mohd Asri & Mohd Yuhazri Yaakob</i>	
Chapter 30	
The Revolution of Smart Game App: MFRS 137 Provisions, Contingent Liabilities and Contingent Assets	161
<i>Norliana Omar, Noor Saatila Mohd Isa, Masetah Ahmad Tarmizi, Mohd Taufik Mohd Suffian & Mohd Zulfikri Abd Rashid</i>	
Chapter 31	
Programming Logic Control Learning Kit	167
<i>Rasyidah Murni, Mohd Fadzlee Azmi, Muhamad Arif Omar & Hisyamuddin Mohamed Ghazali</i>	

Chapter 32	
3KAT (Click, Cost, Cash Flow Calculator)	172
<i>Radziah Mohd Dani & Amienurul Faizdan Mohd Amin</i>	
Chapter 33	
MFRS 140 Investment Property Learning through Gamification – “Challenge of MFRS140: PropertyQuest Game”	177
<i>Noor Saatila Mohd Isa, Masetah Ahmad Tarmizi, Norliana Omar, Mohd Taufik Mohd Suffia & Mohd Zulfikri Abd Rashid</i>	
Chapter 34	
Mastering Problem-Solving in Programming Using PS Mono Games	182
<i>Hasni binti Abdul Ghani, Noor Azzizarina binti Mehat, Fadzilah binti Fadzil, Norlisah binti Samsuri & Hafizah binti Mubara</i>	
Chapter 35	
Assessing User Perceptions on the Directory in the FYP Ecosystem Hub	186
<i>Aminah Bibi binti Bawamohiddin</i>	
Chapter 36	
VOTRaC LexiPlay: Innovating Vocabulary through Card Games	190
<i>Zarinatun Ilyani Abdul Rahman, Syaza Kamarudin, Madaha Hanafi @ Mohd Ghani, Nur Farhana Nasri & Nurul Nadwa Ahmad Zaidi</i>	
Chapter 37	
Transformative Integration: The E-Ordering System Revolutionizing Education at Kuala Selangor Vocational College	195
<i>Hazirah Mahmud, Nurul Syuhadah Idris, Nur Ietrah Shahira Sahrum & Siti Murni Mat Yusoff</i>	
Chapter 38	
Child Care or Child Scare: A Proposal for A Customised Legal Framework for Small Home-Based Childminders in Malaysia	199
<i>Mashitah Abdul Mutalib, Intan Nadia Ghulam Khan, Rahimah Saimin, Abidah Abd Ghafar & Nik Salida Suhaila Nik Saleh</i>	
Chapter 39	
Early Math Matters: Pabino and Mathematics Outcomes	204
<i>Noor Miza binti Abdul Rahman, Ku Norashikin binti Halim & Chew Ping Ping</i>	
Chapter 40	
Rolling InOnAt: Play and Learn Prepositions of Time ‘In’, ‘On’, and ‘At’	214
<i>Ong Elly, Mohamad Safwat Ashahri Mohd Salim, Muhd Syahir Abdul Rani, Nazirul Mubin Mohd Noor & Muhamad Khairul Ahmad</i>	
Chapter 41	
Producing Breakfast Cereal from Artocarpus Altilis (Breadfruit)	220
<i>Hasnida binti Khairudin</i>	

Chapter 42		
Time to Pick, Point and Click!: Immersing in 360-degree Video Games		226
<i>Dianna Suzieanna Mohamad Shah, Mohamad Safwat Ashahri Mohd Salim, Mohd Nur Fitri Mohd Salim, Salwa Othman, Mohamed Izzat Mohamed Khalil & Nur Muhammad Amin Hashim Amir</i>		
Chapter 43		
Exploring the e-Modul Garamia: An Innovative Approach to Enhance Student Understanding in the Preparation of Salt Content Standard		230
<i>Farini Elda Hassan & Lee Tien Tien</i>		
Chapter 44		
Artificial Intelligent Human Recognition and Gesture-Controlled Load Transporter for Industrial Applications		235
<i>Chow Yoong Liang & M. H. Abdul Halim</i>		
Chapter 45		
Developing e-PeKTISS Smartphone Application as Online Teaching and Learning Resource		243
<i>Muhammad Ridzuan Bin Jamhari & Isma Hazwani Binti Ismail</i>		
Chapter 46		
The Development of Predict-Observe-Explain-Visualization (POEV) Module to Reduce Students' Misconception in the Topic of Chemical Bonding		246
<i>Nurulhuda Bt A. Ghani, Corrienna Abdul Talib & Mohd Nashriq Taufik Abu Bakar</i>		
Chapter 47		
Mazemind Numeric Quest		251
<i>Nurul Aini Jaafar, Ahmad Qushairi Mohamad, Fuaada Mohd Siam, Mohammad Izat Emir Zulkifly, Noraihan Afiqah Rawi, Nur Arina Bazilah Kamisan, Siti Mariam Norrulashikin & Wan Rukaida Wan Abdullah</i>		
Chapter 48		
The Use of Bizpitchmasters.edu as a Web-Based Learning Platform for Business Pitching		259
<i>Nor Hidayah binti Ismail & Syukrul Hassani bin Jamaludin</i>		
Chapter 49		
An Arabic Language Learning System (ALLS) for None-Native Speakers: A Requirements Model		264
<i>Hamzah Alaidaros, Abdullah Bazar, Ahmed Basalem, Hussain Belfagih, Moutasem Bin Omar Baomer & Naif Al-Saubai</i>		
Chapter 50		
E-Module The 5 Minutes Spark		273
<i>Masnih binti Mustapa</i>		

Chapter 51

Carbonana Snack

278

Marzatul Syahirah Mohd Lotiffi, Aisyah Hakimah Huslan & Noor Azian Erdawaty Zainudin

Chapter 52

Integrating ScholarSync in Academic Supervision

283

Mohd Nur Fitri Mohd Salim, Muhammad Zulqarnain Mohd Nasir, Muhamad Luqman Sapini, Muhammad Wafi A. Rahman, Mohamad Firdaus Ahmad & Nur Syazwani Zulaikha Safwan

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-Piñero, 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.

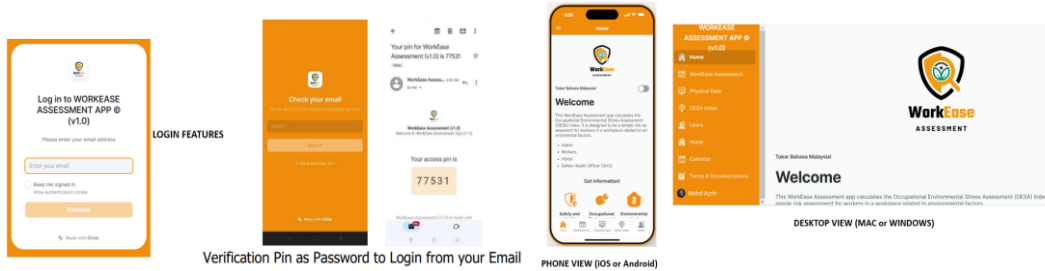


Figure 2: WorkEase Assessment App Preface

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.

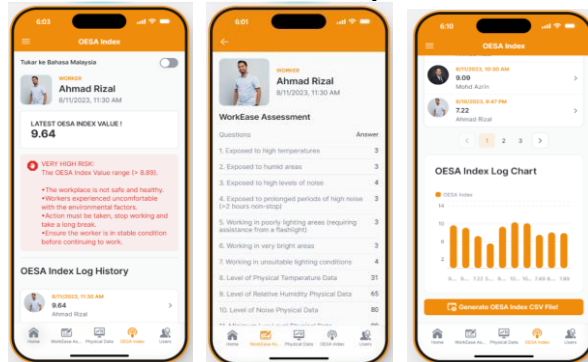


Figure 2: WorkEase Assessment App OESA Index Result

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.

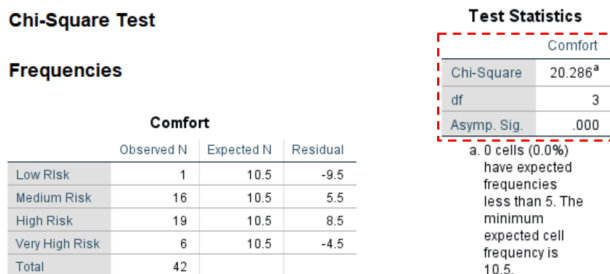


Figure 3: Goodness-of-Fit Index Model

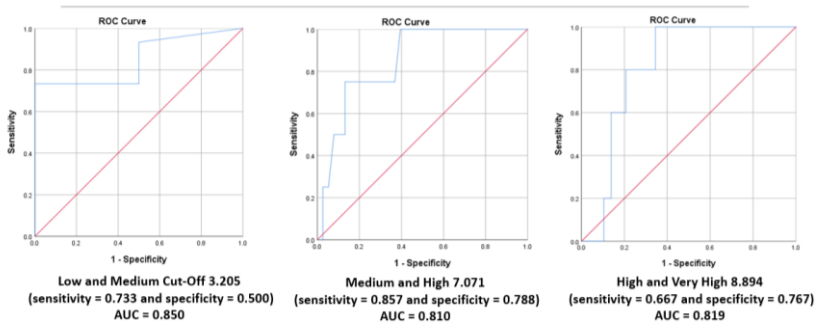


Figure 4: Receiver Operating Characteristic (ROC) Analysis

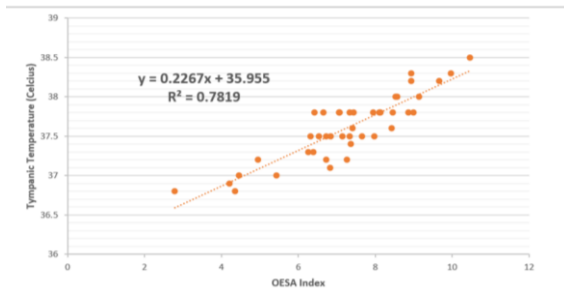


Figure 5: Validity Analysis

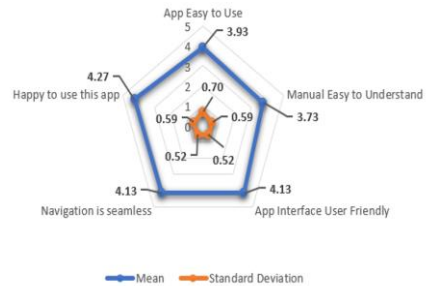


Figure 6: UI/UX Testing

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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