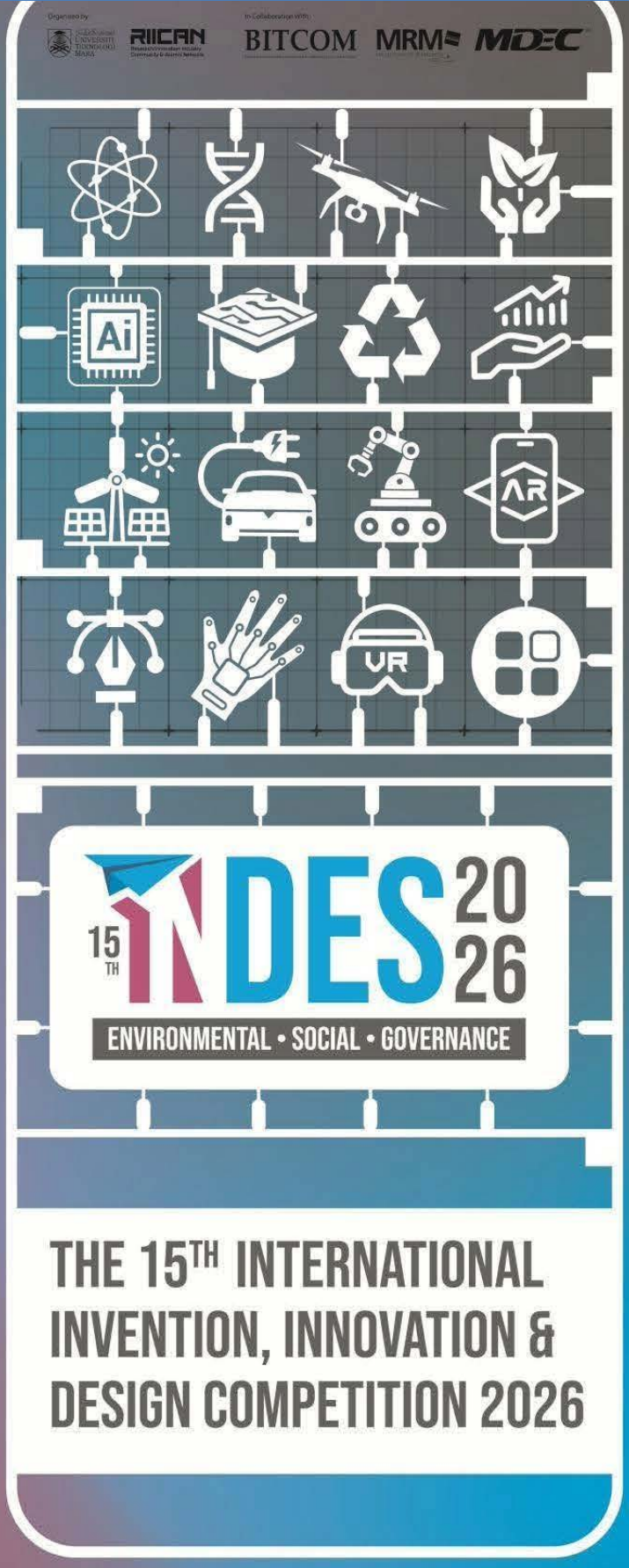


E-BOOK OF

EXTENDED ABSTRACT

E-BOOK OF EXTENDED ABSTRACT

THE 15th INTERNATIONAL
INVENTION, INNOVATION &
DESIGN COMPETITION 2026

Organized by:
Office of Research, Industry,
Community & Alumni Network
UiTM Perak Branch

© Unit Penerbitan UiTM Perak, 2026

All rights reserved. No part of this publication may be reproduced, copied, stored in any retrieval system or transmitted in any form or by any means; electronic, mechanical, photocopying, recording or otherwise; without permission on writing from the director of Unit Penerbitan UiTM Perak, Universiti Teknologi MARA Perak Branch.

Unit Penerbitan UiTM Perak,
Universiti Teknologi MARA,
Perak Branch, 32610
Seri Iskandar Perak, Malaysia.

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e- ISBN 978-967-2776-67-3

Cover Design: Asrul Nizuan Ariffin

Typesetting : Georgia

EDITORIAL BOARD

Editor-in-Chief

Muhd Syahir Abdul Rani

Managing Editors

Muhammad Wajihuddin Johari
Paul GnanaSelvam A/L Pakirnathan
Nazirul Mubin Mohd Noor
Nurdiyana Mohamad Yusof
Halimatussadiah Iksan

Copy Editors

Sheema Liza Idris
Nurul Munirah Azamri
Zarlina Mohd Zamari
NoorAileen Ibrahim
Farahidatul Akmar Awaludin
Siti Syairah binti Fakhruddin
Noor Fazzrienee JZ Nun Ramlan
Madaha binti Hanafi @ Mohd Ghani
Halimatun Saadiah Abd Mutalib
Hanitha A/P Satthiananthan
Syaza Kamarudin
Iza Faradiba Mohammad Patel
Nuramira Anuar
Noorlinda Alang
Noraziah Azizan
Faridatul Akma Wan Mohd Rashdi
Azurawati Zaidi
Ong Elly
Noran Nur Munira Khalili
Amirah Athirah Amir Yazid
Nurshahirah Azman
Daljeet Singh Sedhu A/L Janah Singh
Budiman Sabri Ahmad
Amirul Farhan Ahmad Tarmizi
Sarah Sakinah Assa'adah Johari

ZEXAM: ZTA-BASED ONLINE EXAMINATION SYSTEM

Hazlina Haron, Jai Hobika A/P Kumaran, Syazwina Alias, Nurul Azlia Mat Saat, Ruffinus Rusell Anak Magar

SEGi University, 9, Jalan Teknologi, Pju 5 Kota Damansara, 47810 Petaling Jaya, Selangor

hazlinaharon@segi.edu.my, jaihobikak@gmail.com, ruffinusmagar@segi.edu.my, azliamatsaat@segi.edu.my

ABSTRACT

Academic institutions have accelerated their digitalisation, especially after the pandemic, shifting from traditional paper-based exams to online assessments. However, online examinations remain vulnerable to cheating and academic misconduct. Zero Trust Architecture (ZTA), built on the principle of "never trust, always verify," ensures that every user is thoroughly authenticated before access is granted. While many existing systems focus on detecting cheating through context-switch monitoring, impersonation, where students share credentials with unauthorised individuals, remains a significant threat. ZEXAM addresses this by incorporating keystroke-based authentication, a secure and convenient behavioural biometric that requires no additional hardware. This approach ensures that only verified users can access and complete exams, strengthening integrity and trust in academic assessment.

Keyword: keystroke-based authentication, impersonation, ZTA

1. INTRODUCTION

The purpose of this study is to explore the concept of Zero Trust Architecture for system security. The concept relies on 'never trust, always verify' where all the users are always verified thoroughly before providing access. With this, the system ZEXAM focused on implementing the ZTA concept onto online examination system, a widely adopted platform to conduct examinations by universities, schools, and academic centres after the sharp digital transition from the COVID-19 pandemic.

Online examinations provide easier access to unauthorised materials via the internet, increasing cheating opportunities and academic misconduct. Therefore, ZEXAM tackles this by detecting the context switching during the examination via event-driven programming and rule-based algorithm. In addition to that, cheating by impersonation through unauthorised credential sharing poses serious threats to the integrity of online examinations. ZEXAM addresses this by integrating keystroke-based authentication for an enhanced identity validation and user verification. It is a behavioural biometric that requires no additional hardware setup and captures the unique typing behaviour of each user while they are typing their secure phrase as part of multi-factor authentication. It records the typing speed, key hold time, time between the keystroke, the rhythm and typing flow and compares it with a previously enrolled user's typing profile.

In addition to that, ZEXAM includes account locking to prevent brute-force login attempts and recovery through OTP sent only to the authorised owner's email. Furthermore, it implements strict role-based access controls to isolate students from accessing administrative endpoints with the intention off modifying their examination submission. This ensures that all admin dashboard routes are protected, preventing unauthorised exposure of privileged interfaces, even through direct URL manipulation.

2. METHODOLOGY

2.1. Scrum methodology

This project would be utilising the Agile System Development Life Cycle (SDLC) methodology, specifically its Scrum model due to its lightweight software development approach. The agile technique focuses on 'iterations' or 'increments', which are smaller portions of the software development, where every stage represents the project's progress. Moreover, the approach prioritises client participation and

interaction during the product development process more than the traditional methods like requirements analysis, plans, and tools(Alazzawi et al., 2023).

Additionally, Scrum is a straightforward, easy to comprehend framework for monitoring and controlling every stage of product development, satisfying customer expectations carefully. The Scrum framework has various implementations for its phases, but the core four phases involve Planning, Implementation, Review and Retrospective which is done for every sprint iteratively until the project is completed. The stages under this model are known as sprints which arrange every task required to be completed according to its size and level of design complexity. Furthermore, Scrum is always adjustable and adaptable to any changes in requirements, organising the work to be completed more efficiently and produce a high-quality end product (Alazzawi et al., 2023).

3. FINDINGS

Table 1: Authentication Performance Table

Scenario	Total Attempts	Correctly Detected	Accuracy (%)
Basic authentication	3	3	100%
Keystroke authentication	5	4	80%
OTP-Email verification	3	3	100%
Context switching	3	3	100%

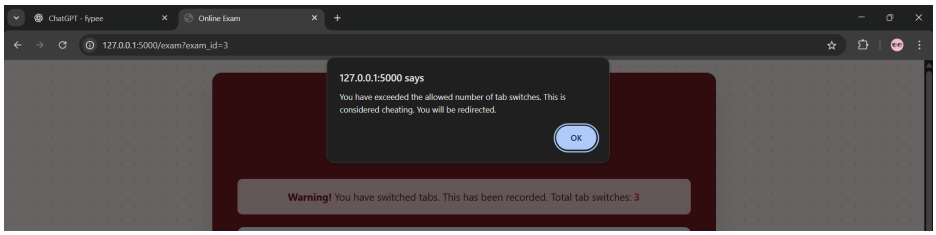


Figure 1: System alert: Exceeded tab switch limit

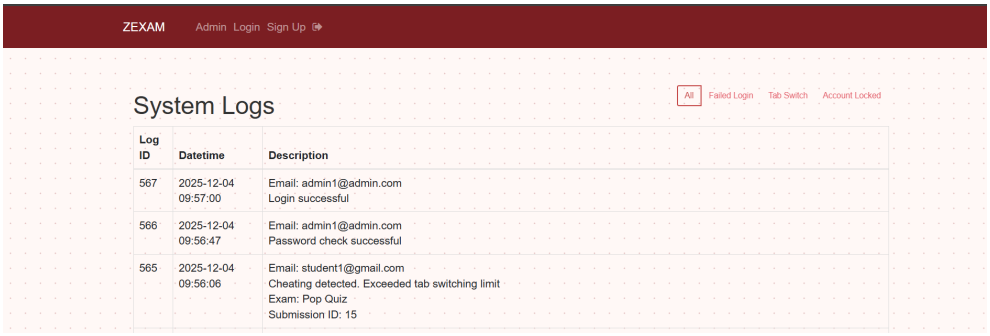


Figure 2: Administrator system log for the exceeded tab switching.

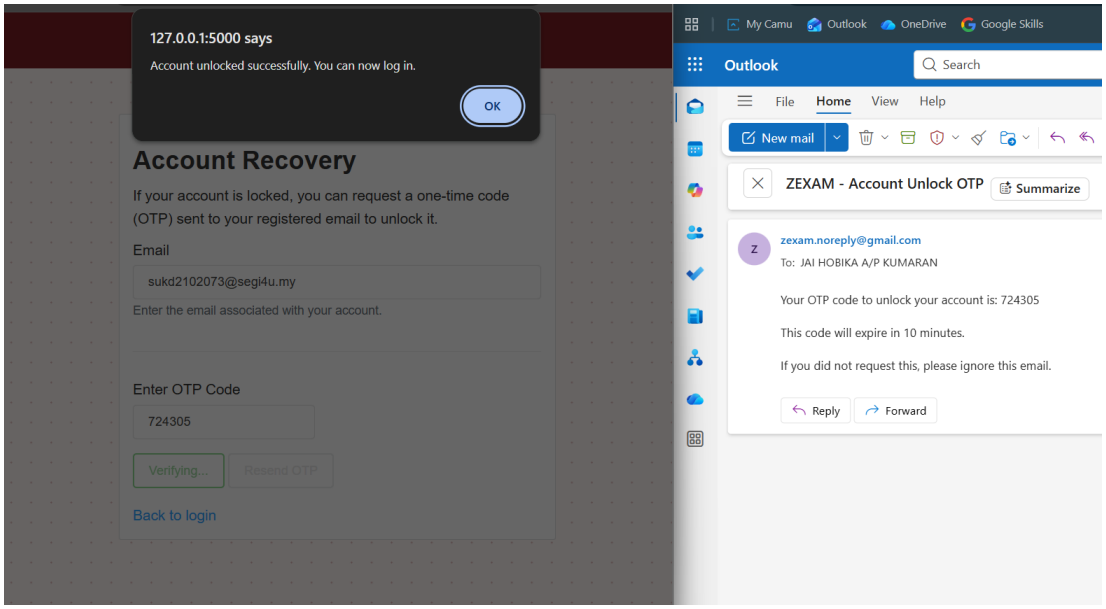


Figure 3: Account recovery page – Email -OTP verification

4. CONCLUSION

In conclusion, ZEXAM, the system developed for this project has successfully managed to mark a significant step towards digitalisation of examinations while strengthening the integrity and security of the platform by utilising the Zero trust approach. It represents a practical and effective solution for institutions seeking to strengthen the fairness, security and accessibility of online examinations.

REFERENCES

Alazzawi, A., Yas, Q. M., & Rahmatullah, B. (2023). A Comprehensive Review of Software Development Life Cycle methodologies: Pros, Cons, and Future Directions. *Iraqi Journal for Computer Science and Mathematics*, *4*(4), 173–190. https://doi.org/10.52866/ijcsm.2023.04.04.014

E-BOOK OF EXTENDED ABSTRACT THE 15th INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2026

eISBN 978-967-2776-67-3

9 789672 776673

Date of Publication: 13 July 2026

UNIT PENERBITAN UITM PERAK

(online)