



THE RELIABILITY FORTRESS: AN AR-POWERED PEDAGOGICAL FRAMEWORK FOR THE TRUST SERVICES PRINCIPLES

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ABSTRACT

Modern Accounting Information Systems (AIS) education faces a significant challenge in which students often perceive system controls as technical "silos" rather than critical management responsibilities. "The Reliability Fortress" is an Augmented Reality (AR) pedagogical innovation designed to bridge this gap for 4th-semester accounting students. By transforming the dense technical frameworks of COBIT 2019 Trust Services Framework into an interactive digital "Quest," this design provides a multi-sensory learning environment. The purpose is to move beyond rote memorization of the five principles of system reliability: Security, Confidentiality, Privacy, Processing Integrity, and Availability. Key features include a physical "Knowledge Map" poster that serves as a portal to four immersive AR zones. These zones simulate the learning objective as managing the security life cycle, enforcing data masking for privacy, and calculating recovery objectives to foster a "security-conscious" culture. This interactive approach allows students to better understand the element of system reliability and evaluate the cost-effectiveness of controls while preparing for professional roles in internal audit and management.

KEYWORDS: Accounting Information Systems, Augmented Reality, COBIT 2019, System Reliability, Trust Services Framework.

PROBLEM AND OBJECTIVE

Fourth-semester accounting students sometimes struggle to comprehend the system dependability chapter in Accounting Information Systems (AIS) owing to its intricate technicality. Classroom observations and evaluation findings indicate that several students find it challenging to distinguish and implement the five criteria of system reliability: security, confidentiality, privacy, processing integrity, and availability. Analysis of prior semester evaluations revealed that a considerable percentage of students performed inadequately on questions pertaining to system controls and information security principles, indicating a restricted conceptual comprehension beyond mere memorization.

A significant problem is a cognitive gap in which students see information security only as an IT obligation, rather than a management duty shared by accountants and internal auditors. This fallacy is troublesome since, in fact, accountants are crucial in assessing internal controls, guaranteeing data veracity, and controlling organizational risks.



Moreover, conventional pedagogical methods, including lectures and textbook descriptions, often do not assist students in comprehending the intricate and multifaceted nature of security measures. Concepts like Defense-in-Depth and the interplay among several control layers are abstract, hindering students' ability to connect theoretical frameworks with practical organizational applications. Consequently, students often depend on rote memory for assessments instead of cultivating a comprehensive awareness of how system reliability controls collaboratively safeguard corporate data.

This invention presents an Augmented Reality (AR)-based learning methodology to tackle these difficulties. The primary objectives of this innovation are:

- (1) to convert abstract system control concepts into a concrete and visual mental model utilizing augmented reality
- (2) to transition the learning paradigm from passive reading to active learning
- (3) to furnish students with an accessible and gamified learning tool that reinforces the five fundamental principles of system reliability while aiding in examination preparation.

DESIGN DESCRIPTION

"The Reliability Fortress" is a physical-to-digital teaching tool designed for 4th-semester Bachelor of Accounting students. The design consists of an infographic poster of a medieval fortress where each architectural element represents a Trust Services principle.

- The Foundation (Information Security): Students scan the fortress walls to unlock a calculator for the Time-Based Model ($P > D + R$). They must adjust protection, detection, and response times to ensure security is effective.
- The Vaults (Confidentiality and Privacy): These towers demonstrate the "Life Cycle" of data protection. AR overlays allow students to interact with Information Rights Management (IRM) and see how Data Masking (Tokenization) swaps real PII (Personally Identifiable Information) for tokens to satisfy GDPR requirements.
- The Gate (Processing Integrity): This zone functions as a "Digital Inspection" station. Students apply input controls like Field Checks and Limit Checks to incoming data to prevent "Garbage In, Garbage Out".
- The Lifeboat (Availability): Students use an interactive timeline to set Recovery Point Objectives (RPO) and Recovery Time Objectives (RTO) based on different business resiliency scenarios.



VISUALS



Figure 1: The foundational relationship where Security supports Confidentiality, Privacy, Processing Integrity, and Availability.

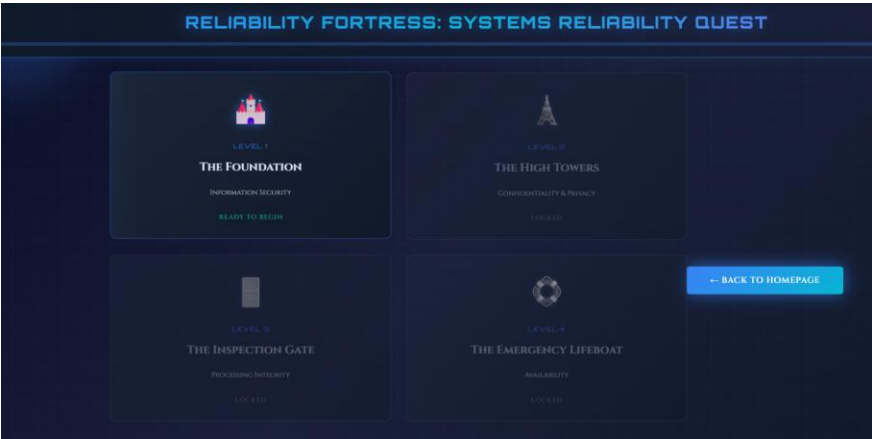


Figure 2: Interactive AR timeline (“Quest”) for students to start their exploration in the AR

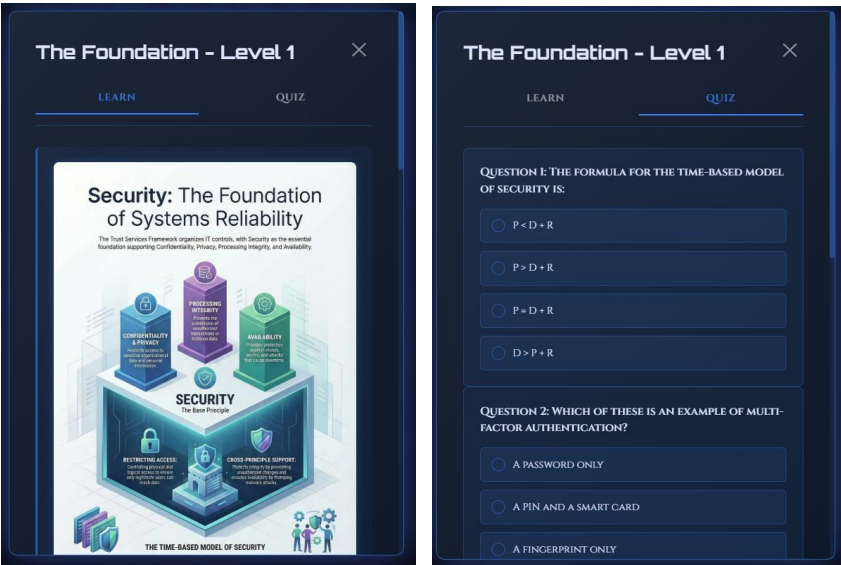


Figure 3: The AR function division



NOVELTY AND UNIQUENESS

Unlike traditional e-learning modules or static textbooks, this design incorporates the “People Factor” by using gamification to enhance student engagement and understanding. The innovation introduces an Augmented Reality (AR)-based pedagogical framework for teaching the Trust Services Principles in Accounting Information Systems. Through AR visualization, students are able to explore and better understand the relationships between the elements of system reliability. In addition, each interactive activity is directly aligned with the intended learning outcomes, ensuring that students actively learn how security, confidentiality, privacy, processing integrity, and availability work together. This approach contributes to AIS education by providing a more interactive and experiential way to understand system reliability concepts.

BENEFITS TO MANKIND

This innovation benefits society by producing a new generation of "security-conscious" accountants. As future auditors and managers, these students will be better equipped to protect the privacy of customer data, prevent financial losses from system downtime, and ensure the integrity of financial reporting in the global economy. By reducing the "People" risk in organizations, the design helps mitigate the life-threatening consequences of medical identity theft and the economic damage of data breaches.

COMMERCIAL POTENTIAL

"The Reliability Fortress" has high scalability as a licensed educational software for universities and professional bodies (e.g., AICPA, ACCA). Its competitive advantage lies in its specific alignment with internationally recognized audit standards. The business model involves a one-time purchase of the "Knowledge Map" poster with a subscription-based AR app. A cost analysis indicates that implementing this tool reduces the long-term cost of student retraining and improves professional exam pass rates.

CONCLUSION

"The Reliability Fortress" successfully transforms dense technical frameworks into an engaging, interactive "Quest" for 4th-semester accounting students. By integrating AR technology with the Trust Services Framework, the design bridges the gap between IT knowledge and managerial responsibility. Future directions include expanding the fortress to include a "Blockchain Tower" for advanced audit students and integrating AI to provide personalized exam-readiness feedback. Ultimately, this innovation ensures that the accountants of tomorrow are assets, not the "weakest links," in information security.

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