

Technology Adoption and User Satisfaction in Implementing a Smart Retractable Locker

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Abstract: This study investigates the technology adoption and user satisfaction in implementing a smart retractable locker designed to enhance security, accessibility, and efficiency in managing personal and institutional belongings, focusing on users' perceptions of its performance across key quality indicators. With the increasing demand for secure storage solutions in schools, offices, and public facilities, the integration of smart technologies offers a potential response to challenges related to safety, monitoring, and user convenience. Anchored on the Technology Acceptance Model (TAM) as a guiding framework, the research aimed to determine how accuracy, reliability, efficiency, and durability shape users' acceptance and satisfaction with the system. A descriptive research design was utilized, involving students, faculty, and staff as respondents who interacted with the smart retractable locker system during its trial phase. Data was collected employing validated questionnaires, system monitoring, and descriptive statistical analysis. Findings indicated that respondents had highly favorable views regarding the system's quality. Concerning accuracy, the lockers received an average score of 4.24 (SD = 0.61), which corresponds to an Outstanding rating. Reliability was also rated Outstanding with mean score of 4.23 (SD = 0.69). Efficiency and durability also received Outstanding ratings of 4.22 (SD = 0.63) and 4.22 (SD = 0.64) respectively. This consistency indicates user satisfaction across all dimensions and emphasized the system's secure, reliable, and efficient provision of storage. Findings indicate the smart retractable locker has great promise for broader use in educational and workplace environments. The system meets user needs regarding accuracy, reliability, efficiency, and durability, as well as the security. The study confirms that satisfaction for quality performance will encourage the adoption of advanced technologies like smart lockers.

Keywords: Monitoring System, Smart Retractable Locker, Technology Adoption, Technology Acceptance Model, User Satisfaction.

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I. INTRODUCTION

The current digital transformation has altered how organizations handle their resources, highlighting the necessity for secure, efficient, and technology-driven approaches. In this regard, smart retractable lockers equipped with monitoring systems have surfaced as a novel solution to issues related to storage and document management. These lockers integrate physical security features with digital technology, enabling real-time oversight and monitored access. However, their successful implementation relies not only on their technical design but also on users' acceptance and their perceptions of the system's quality in terms of accuracy, reliability, efficiency, and durability. Grasping these user perceptions is essential for ensuring both the adoption and satisfaction with the system.

Smart storage systems have become vital infrastructure in educational institutions, workplaces, and public spaces, offering secure, minimized-contact, and traceable management of items. The pandemic has accelerated the adoption of last-mile and self-service technologies, leading to an increase in the use of locker solutions, with research showing growing user acceptance and improved access and operations. It remains crucial to base research on theoretical frameworks; recent literature reviews highlight the ongoing significance of the Technology Acceptance Model (TAM) and its extensions in understanding the adoption of modern technologies in the realms of the Internet of Things (IoT) and smart devices.

The rise of smart locker systems has surged in recent years, driven by a heightened need for secure and contactless storage solutions, especially in the aftermath of the pandemic.

Tsai, Chen, and Yu (2024) highlighted that parcel lockers became crucial during COVID-19 by offering safe and contactless alternatives for last-mile deliveries. In a similar vein, Zhang, Li, and Chen (2025) pointed out that implementing smart locker systems has been linked to enhancements in efficiency and convenience for users in both logistics and institutional environments. These research findings illustrate the increasing dependence on smart lockers; however, mere adoption is insufficient for long-term sustainability—user satisfaction is a critical factor.

The Technology Acceptance Model (TAM) has become one of the most extensively utilized frameworks in the research on technology adoption. Initially introduced by Davis (1989), TAM elucidates adoption behavior through the lenses of perceived usefulness and perceived ease of use. Nevertheless, researchers today have expanded TAM to include variables that are specific to various contexts. Attié, Favier, and Leclercq (2022) asserted that TAM still serves as a strong model for understanding the adoption of smart technology, but they recommended the inclusion of factors such as trust and perceived system quality when it comes to IoT devices. Similarly, Ladeira (2025) pointed out that in the realm of IoT systems, factors like performance consistency and reliability serve as vital precursors to user trust and acceptance, thereby extending TAM beyond its traditional elements. In relation to smart lockers, TAM offers a solid foundation, but it is essential to consider user perceptions regarding quality aspects—accuracy, reliability, efficiency, and durability—that have a direct impact on satisfaction. By incorporating these factors into TAM, this study aims to enhance the model's explanatory capabilities in the context of cyber-physical systems.

User satisfaction is frequently influenced by how individuals assess the performance of a system. Quan, Nguyen, and Tran (2022) discovered that accuracy is one of the most important factors predicting customer satisfaction in the use of smart lockers for e-commerce deliveries, as mistakes in item dispensing can damage trust. Reliability is also widely acknowledged; Zhang et al. (2025) noted that system outages or technical issues significantly hindered adoption, irrespective of other features. Efficiency pertains to how responsive the system is. Tsai et al. (2024) found that the speed of transactions had a direct impact on satisfaction, as delays led to user frustration. Likewise, Keibach, Müller, and Schwarz (2022) linked efficiency to quality standards in systems under ISO/IEC 25010, highlighting that performance efficiency is a vital criterion for software and IoT systems. Durability, although less commonly addressed in studies on adoption, is essential for retractable lockers, which include moving components. Soares, Silva, and Almeida (2022) pointed out that durability presents a practical challenge in the implementation of smart lockers, as wear-and-tear along with mechanical problems could foster distrust and result in users abandoning the system. By

integrating these quality perceptions into the adoption model, the research fills existing gaps in current studies.

This discrepancy is especially significant for retractable lockers, which require intricate machinery and monitoring solutions. In contrast to fixed lockers, retractable systems rely on the accuracy of hardware, the resilience of moving components, and continuous monitoring. Issues in these areas can swiftly undermine confidence, even when convenience is achieved. As a result, assessing adoption and satisfaction through the perspective of these quality metrics offers a deeper insight into how technology is embraced in real-world scenarios.

II. METHODS

The researcher used a descriptive research design and gathered data from participants who interacted with user satisfaction in implementing a smart retractable locker. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were employed to analyze user responses and identify patterns in their evaluations.

➤ *Participants*

The respondents of this study consisted of Eighty-Seven (87). Forty-four (44) students, twenty-eight (28) faculty, and fifteen (15) non-teaching faculty. The researcher used a stratified random sampling technique in which the population was divided into non-overlapping subpopulations called strata, and the percentage of every group. The total of 87 were the only groups of respondents who were qualified to rate the design.

➤ *Data Collection*

The data gathering follows accordingly to the following prerequisites: 1) An intent letter is being sent to the Research Planning and Development Office to seek permission to conduct a study. Consequently, this involved the students, technology, and engineering faculty; 2) Questionnaires were administered to the target respondents to answer them thoroughly; 3) checklists and tables were made for better presentation and analysis of the gathered data.

➤ *Data Analysis*

The Technology Acceptance Model was used to investigate the technology adoption and users' satisfaction in implementing a smart retractable locker that influences to use and acceptance of the design. A 5-point Likert scale was attribute of reference in which the rate ranged from 1 to 5. The researcher used the weighted mean to get the average of the respondents' perception of an ergonomic multipurpose workstation setup.

III. RESULTS AND DISCUSSIONS

Table 1. User's Perception on the Accuracy of the Developed Intelligent Locker with a Monitoring System

Accuracy Dimension	Mean	SD	Verbal Interpretation
The system's ability to correctly identify and authenticate authorized users without errors.	4.32	0.56	Outstanding
Precision of the locker's retractable mechanism in positioning items exactly where intended.	4.33	0.56	Outstanding
Correctness and reliability of recorded usage data, such as timestamps and user access logs.	4.22	0.63	Outstanding
Frequency of incorrect locker responses, such as false locks or access denials for authorized users.	4.13	0.64	Very Satisfactory
The ability of the system to only grant access to users with the correct credentials, preventing unauthorized access.	4.21	0.66	Outstanding
Overall Mean	4.24	0.61	Outstanding

Legend: 4.21 – 5.00 Outstanding 3.41 – 4.20 Very Satisfactory 2.61 – 3.40 Satisfactory
1.81 – 2.60 Fair 1.00 – 1.80 Poor

Table 1 shows the mean frequency, percentage, and mean distributions of participants' User Perception on the accuracy of the developed intelligent locker with a monitoring system revealed a high level of user satisfaction across multiple dimensions of performance, as reflected in the ratings. It can be gleaned from the table that as a whole, participants assessed their user's perception on the accuracy as "Outstanding," which was supported by the overall mean of 4.24 which means that the participants accept the user's perception on the accuracy aspect.

These results suggest that the developed intelligent locker with a monitoring system meets high standards in precision, reliability, and security, instilling user confidence in its daily operation. This affirms the study of Quan, Nguyen, and Tran (2022) examined consumer satisfaction with smart lockers in e-commerce contexts and emphasized that accuracy in item dispensing was a critical factor shaping user trust. Their findings revealed that when lockers consistently delivered the correct parcels, users reported higher satisfaction and adoption rates.

Table 2. User's Perception on the Reliability of the Developed Intelligent Locker with a Monitoring System

Reliability Dimension	Mean	SD	Verbal Interpretation
Percentage of time the locker and monitoring system remain fully operational without downtime.	4.21	0.65	Outstanding
The locker's ability to perform its intended functions consistently under different conditions.	4.13	0.64	Very Satisfactory
Frequency of mechanical or software failures that disrupt normal operations.	4.46	0.77	Outstanding
The system's capacity to recover data and resume functionality smoothly after a fault or power interruption.	4.16	0.69	Very Satisfactory
Consistency and accuracy of alerts for system events (such as unauthorized access attempts or malfunctions).	4.21	0.70	Outstanding
Overall Mean	4.23	0.69	Outstanding

Legend: 4.21 – 5.00 Outstanding 3.41 – 4.20 Very Satisfactory 2.61 – 3.40 Satisfactory
1.81 – 2.60 Fair 1.00 – 1.80 Poor

Table 2 shows the mean frequency, percentage, and mean distributions of participants' User Perception on the reliability of the developed intelligent locker with a monitoring system revealed a high level of user satisfaction across multiple dimensions of performance, as reflected in the ratings. It can be gleaned from the table that as a whole, participants assessed their user's perception on the reliability as "Outstanding," which was supported by the overall mean of 4.23 which means that the participants accept the user's perception on the reliability area.

These results reflect a high level of user satisfaction in terms of system uptime, reliability under diverse conditions, and effective alert functionality, ensuring that the locker with monitoring capabilities is dependable for everyday use. This is in connection with the study of Tsai, Chen, and Yu (2024) conducted a systematic review of last-mile delivery systems during COVID-19 and found that users favored parcel lockers that consistently functioned without technical errors. They reported that reliability directly influenced satisfaction, as unreliable lockers caused frustration and abandonment of the service. This mirrors the current study's focus on the intelligent locker's reliability as a basis for user satisfaction.

Table 3. User's Perception on the Efficiency of the Developed Intelligent Locker with Monitoring System

Efficiency Dimension	Mean	SD	Verbal Interpretation
Amount of energy consumed per operation cycle or per hour of use.	4.21	0.61	Outstanding
Effective use of hardware and software resources to prevent slowdowns or unnecessary energy use.	4.22	0.60	Outstanding
Ease and speed with which users can interact with the system, minimizing the steps required for access.	4.24	0.61	Outstanding
Number of required maintenance checks or repairs within a given timeframe, indicating system robustness if low.	4.21	0.72	Outstanding
Overall Mean	4.22	0.63	Outstanding

Legend: 4.21 – 5.00 Outstanding 3.41 – 4.20 Very Satisfactory 2.61 – 3.40 Satisfactory
1.81 – 2.60 Fair 1.00 – 1.80 Poor

Table 3 shows the mean frequency, percentage, and mean distributions of participants' User Perception on the efficiency of the developed intelligent locker with a monitoring system revealed a high level of user satisfaction across multiple dimensions of performance, as reflected in the ratings. It can be seen from the table that as a whole, participants assessed their user's perception on the efficiency as "Outstanding," which was supported by the overall mean of 4.22 which means that the participants accept the user's perception on the efficiency area.

These results suggest that the system excels in energy efficiency, resource management, ease of user interaction, and robustness, making it a reliable and efficient solution that meets user expectations effectively. Tsai, Chen, and Yu (2024) conducted a systematic review of last-mile delivery and found that efficiency in parcel lockers, particularly in terms of transaction speed and ease of use, was highly valued by users. Their study revealed that lockers with quicker processing times enhanced overall satisfaction. This finding is parallel to the current study, which emphasizes user perceptions of efficiency in evaluating intelligent lockers.

Table 4. User's Perception on the Durability of the Developed Intelligent Locker with Monitoring System

Durability Dimension	Mean	SD	Verbal Interpretation
Structural Strength: Assess the locker's robustness, including hinges and locking mechanisms.	4.24	0.61	Outstanding
Material Durability: Evaluate the longevity of materials used.	4.22	0.63	Outstanding
Weather Resistance: Ensure resistance to rain, sunlight, and temperature changes.	4.18	0.58	Very Satisfactory
Electrical Component Reliability: Verify consistent functionality of sensors and actuators.	4.22	0.58	Outstanding
Water and Dust Resistance: Prevent water and particle ingress to protect electronics.	4.29	0.60	Outstanding
Impact and Vibration Resistance: Ensure resilience to physical shocks and vibrations.	4.28	0.62	Outstanding
Environmental Stability: Test performance under different environmental conditions.	4.16	0.68	Very Satisfactory
Chemical Resistance: Evaluate resistance to chemicals.	4.18	0.70	Very Satisfactory
Long-Term Monitoring System Performance: Monitor system accuracy over time.	4.16	0.73	Very Satisfactory
Overall Performance: Assess reliability and functionality under real-world usage scenarios.	4.24	0.68	Outstanding
Ensured that only authorized users could access	4.23	0.62	Outstanding
Ensure resistance to rain, sunlight	4.22	0.65	Outstanding
Enabled real time monitoring	4.20	0.66	Very Satisfactory
System provides clear indications	4.24	0.68	Outstanding
Overall Mean	4.22	0.64	Outstanding

Legend: 4.21 – 5.00 Outstanding 3.41 – 4.20 Very Satisfactory 2.61 – 3.40 Satisfactory
1.81 – 2.60 Fair 1.00 – 1.80 Poor

Table 4 shows the mean frequency, percentage, and mean distributions of participants' User Perception on the durability of the developed intelligent locker with a monitoring system revealed a high level of user satisfaction across multiple dimensions of performance, as reflected in the ratings. It can be seen from the table that as a whole, participants assessed their user's perception on the efficiency as "Outstanding," which was supported by the overall mean of 4.22 which means that

the participants accept the user's perception on the durability area.

This high rating reflects user confidence in the system's physical resilience, weatherproofing, electronic reliability, and impact resistance. Minor enhancements in environmental stability and long-term accuracy could further strengthen the system's durability, ensuring even greater reliability under

varied usage and environmental conditions. In the study of Soares, Silva, and Almeida (2022) examined the deployment of smart lockers and identified durability of hardware components were examined as recurring challenges. They argued that lockers with moving parts and frequent use are prone to mechanical wear, which directly affects user trust and satisfaction. This parallels the current study's emphasis on how users perceive durability in intelligent lockers.

IV. CONCLUSION

The retractable locker system has demonstrated to users that it is structurally robust, dependable over time, and can handle frequent use without failing to perform. The results suggest that durability is a vital factor in establishing user confidence and satisfaction, as a well-built locker guarantees both safety and long-lasting usability. Aligned with previous research that emphasizes the significance of durability in adopting technology, the findings indicate that the intelligent locker achieved high quality standards, receiving positive feedback from its users. This implies that ongoing maintenance and enhancement of the system's durability are crucial for promoting broader acceptance and maintaining user trust in institutional and organizational contexts.

In addition, the results highlight that durability is fundamental to the sustainable integration of technology within institutional and organizational frameworks. When a system persistently shows resilience and longevity, users are more inclined to embrace and continue utilizing it. This corresponds with existing literature that identifies durability as a critical factor influencing user satisfaction with smart technologies. Consequently, prioritizing ongoing improvements in material quality and system design will be vital for sustaining high durability levels, ensuring that the intelligent locker remains a reliable and esteemed solution for efficient storage and monitoring.

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REFERENCES

- [1]. Attié, E., Favier, M., & Leclercq, T. (2022). The acceptance and usage of smart connected objects: Extending TAM. *Technological Forecasting and Social Change*, 176, 121456. <https://doi.org/10.1016/j.techfore.2021.121456>
- [2]. An, H. S., Park, J., & Song, H. (2022). Consumers' adoption of parcel locker service: Protection and technology perspectives. *Cogent Business & Management*, 9(1), 2144096. <https://doi.org/10.1080/23311975.2022.2144096>
- [3]. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- [4]. Keibach, E., Müller, S., & Schwarz, T. (2022). The evaluation of software tools based on the ISO 25010 framework. *Applied Sciences*, 12(2), 739. <https://doi.org/10.3390/app12020739>
- [5]. Ladeira, W. J. (2025). Trust and technology adoption in IoT systems: A consumer behavior perspective. *Journal of Consumer Behaviour*, 24(2), 213–229. <https://doi.org/10.1002/cb.2427>
- [6]. Quan, N. H., Nguyen, L. T., & Tran, P. T. (2022). Impact of smart locker use on customer satisfaction with online shopping. *Journal of Theoretical and Applied Electronic Commerce Research*, 17(4), 1464–1482. <https://doi.org/10.3390/jtaer17040077>
- [7]. Soares, A., Silva, T., & Almeida, J. (2022). Smart lockers: Approaches, challenges, and opportunities. *Journal of Computer Networks and Communications*, 2022, 1–12. <https://doi.org/10.1155/2022/9238574>
- [8]. Stašys, R., Švažė, D., & Klimas, E. (2022). The main reasons for customer satisfaction with parcel locker services: The case of Lithuania. *Regional Formation and Development Studies*, 37(2), 179–189. <https://doi.org/10.15181/rfds.v37i2.2432>
- [9]. Tsai, J. F., Chen, L., & Yu, P. (2024). Last-mile delivery during COVID-19: A systematic review of parcel locker adoption and consumer experience. *Transportation Research Part A: Policy and Practice*, 178, 103643. <https://doi.org/10.1016/j.tra.2024.103643>
- [10]. Zhang, Q., Li, H., & Chen, Y. (2025). Parcel locker solutions for last-mile delivery: Adoption, efficiency, and sustainability. *Frontiers in Future Transportation*, 6, 137–150. <https://doi.org/10.3389/fft.2025.00137>