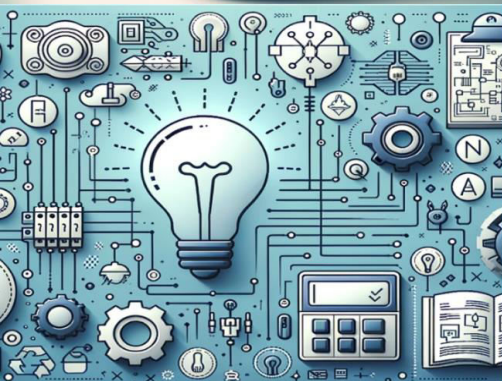




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# ViolaTrack: A QR Code-Based System for Automated Student Violation Monitoring in NEMSU-Cantilan, Surigao del Sur

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**ABSTRACT:** This study addressed the limitations of manual student violation recording at NEMSU-Cantilan, which often led to documentation delays and inconsistent reporting. To resolve these issues, the researchers developed ViolaTrack, an automated system utilizing QR code technology to streamline violation tracking. Developed using the Agile Model for iterative refinement, the system features QR-based identification, automated logging, real-time status tracking, and centralized data management. Evaluation based on ISO/IEC 25010 standards revealed high user satisfaction, with an overall mean score of 4.53, interpreted as "Strongly Agree". The system enhances administrative transparency and efficiency, promoting better discipline and accountability within the campus.

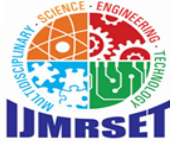
**KEYWORDS:** QR Code System, Agile Methodology, Student Monitoring, Automated Violation Tracking, System Evaluation, ISO/IEC 25010.

## I. INTRODUCTION

At the North Eastern Mindanao State University - Cantilan Campus, the traditional manual methods used to monitor student violations have proven to be inefficient and inaccurate. These manual systems rely on physical logbooks and written reports, which are inherently prone to documentation delays, record loss, and a significant lack of transparency. Such inefficiencies make it difficult for administrative staff to track repeat offenses effectively and leave students or guardians uninformed about disciplinary statuses. Currently, there is a clear gap in the integration of automated reporting and real-time notification technologies, which leads to time-consuming administrative burdens and potential human error.

The development of ViolaTrack directly addresses these challenges by streamlining the violation recording process through QR code technology. By assigning unique scannable codes to students, the system ensures real-time data entry and enhances institutional communication through automated email notifications. This modernization not only simplifies the workload for OSWD staff and security officers but also promotes a more disciplined environment by providing students with immediate feedback on their conduct. Ultimately, the significance of this study lies in its ability to centralize data management, providing administrators with the accurate records necessary for informed decision-making and proactive policy enforcement.





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### II. LITERATURE REVIEW

An analytical evaluation of existing scholarship regarding student oversight and behavioral documentation systems was performed to contextualize the present study within current academic frameworks. As institutional security and behavioral management grow more complex, a significant number of academic organizations are transitioning toward digital governance. For institutions like NEMSU-Cantilan, ensuring the integrity of disciplinary data and the availability of monitoring tools is vital. The optimal strategy for these entities involves moving away from outdated, manual ledger-based recording and adopting unified digital environments that offer comprehensive features like instant verification and live tracking. Although previous research has examined the consequences of administrative bottlenecks and student non-compliance, there remains a gap where technical solutions fail to prioritize the operational needs of campus security and administrative personnel. Despite the long-standing existence of student handbooks, the lack of digital integration at the departmental level highlights a major opportunity for advancing cross-platform monitoring technologies.

The work of Phirke, A. [1] in 2024 explored the efficacy of QR Code-Based Identification Systems, highlighting how the absence of automated tracking in academic settings results in substantial administrative delays. The researcher noted that manual entry serves as a functional barrier, as personnel are often overwhelmed by the physical paperwork and the tedious nature of record retrieval. This disorganized approach leads to critical information gaps, allowing recurring infractions to be overlooked. The ViolaTrack system mitigates these issues by implementing an automated QR scanning interface, enabling security staff to document violations digitally and eliminating the need for handwritten logs, thereby fostering the transparency and accountability emphasized by Phirke.

In 2022, Rangsang Purnama [2] evaluated Violation Monitoring Information Systems (ViMoIS), identifying that the primary cause of persistent disciplinary friction is the delay in notifying stakeholders. The study argued that without a robust mechanism for immediate communication between students, parents, and administrators, effective rule enforcement is hindered. The findings suggest that for monitoring systems to be effective, they must be "user-centric" to encourage staff engagement. ViolaTrack aligns with this by prioritizing accessibility via its web-based architecture and automated email alerts. By fulfilling the "user-friendly" criteria proposed by Purnama, this project offers the technical infrastructure necessary to overcome the communication barriers identified in their research.

Olipas et al. [3] investigated the Challenges of Student Information and Violation Management in 2020, pointing out that conventional pen-and-paper methodologies are highly susceptible to loss, physical damage, and human error. Furthermore, they observed that the absence of real-time digital feedback prevents students from immediately understanding the consequences of their behavior. They suggested that future frameworks must prioritize reliability to handle high-frequency data traffic. ViolaTrack utilizes a MySQL-driven architecture to phase out the analog methods criticized by Olipas. By incorporating QR technology, the system delivers the "instant digital feedback" required for modern enforcement, allowing staff to validate records immediately through a scanner.

In 2023, Garrido [4] examined Trends in Automated Student Monitoring, asserting that digital governance is essential for the sustained effectiveness of campus policies. The research emphasized that for a new system to achieve widespread adoption, it must reduce the logistical burden on both administrative users and the student body. This work centered on the "acceptability" of digital tools within traditional educational settings. The assessment of ViolaTrack through the ISO/IEC 25010 quality standard directly addresses these concerns. With a "Strongly Agree" rating and a mean of 4.53, this study demonstrates that digital disciplinary systems are highly viable for campus integration when developed with a focus on stability and ease of use.

Finally, Casunuran [5] introduced Comprehensive Security and Monitoring Systems for schools in 2020, focusing on how tracking technology can safeguard the reliability of student data. The study posited that establishing a digital identity for every student is the foundational step toward sophisticated campus management. Casunuran's work underscores the security advantages of maintaining centralized, digital records. By providing each student with a distinct digital identity via QR codes, ViolaTrack establishes the data foundation necessary for the security and monitoring protocols described in their research.



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Table 1. Summary of Relevant Literatures

No.	Paper Title	Author Name	Key Points	Remarks
1	QR Code-Based Identification Systems in Institutional Settings	Phirke, A. (2024)	Manual entry causes administrative lag and significant data gaps.	Validates QR efficiency but lacks automated stakeholder notification.
2	Violation Monitoring Information Systems (ViMoIS): A Digital Approach	Rangsang Purnama (2022)	Communication delays between school and home hinder rule enforcement.	Highlights that system success depends on real-time stakeholder engagement.
3	Challenges of Student Information and Violation Management	Olipas et al. (2020)	Analog records are prone to damage; lack of instant feedback slows discipline.	Establishes the link between immediate digital feedback and student conduct.
4	Trends for Automated Student Monitoring in Philippine Schools	Garrido (2023)	Digital governance must minimize logistical burdens to be accepted by staff.	Successfully contextualizes digital transition within Philippine local campuses.
5	Comprehensive Security and Monitoring Systems for Academic Institutions	Casunuran (2020)	Digital student identities are foundational for secure campus management.	Focuses on data integrity protocols rather than the front-end user experience.

In summary, the existing literature confirms that while formal disciplinary codes are well-established, the technical means of enforcing them at the campus level remain underdeveloped. ViolaTrack addresses this deficiency by offering a dependable, low-friction digital solution that corresponds with contemporary movements toward data-driven school administration and automated governance.

III. METHODOLOGY

Research Design

The researchers utilized a Descriptive Developmental Research method, guided by the Agile Model of the Software Development Life Cycle (SDLC). This approach prioritized an iterative workflow, allowing for continuous refinement based on user feedback. Rather than using experimental variables, the study focused on the systematic creation of a specialized software solution and evaluated its performance through standardized metrics within the actual administrative environment of the university.

Instrument

To assess the quality of the developed system, a survey based on the ISO/IEC 25010 Software Quality Model was employed. The evaluation tool used a five-point Likert scale to gather data on several critical software attributes, including Functional Suitability, User Interface/Usability, Reliability, and Data Security. Each item in the questionnaire was specifically tailored to measure how effectively the system digitizes and manages student disciplinary records compared to traditional methods.

Data Collection and Participants

Data was gathered from a purposive sample of 50 respondents within the NEMSU-Cantilan community. The participant pool consisted of 15 administrative users (Office of Student Welfare and Development staff and security personnel), 25 student end-users, and 10 technical experts in the field of Information Technology. Before completing the evaluation, all participants were given a comprehensive walkthrough and live demonstration of the ViolaTrack system's features, specifically the QR code scanning process and the automated notification system.



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### Data Analysis

The quantitative data gathered from the evaluation were analyzed using the following statistical treatments:

1. Weighted Mean: Calculated to identify the average performance rating for each quality characteristic defined by the ISO standard.
2. Qualitative Interpretation: Mean scores were categorized into descriptive levels (e.g., 4.21 – 5.00 as "Strongly Agree") to determine the overall level of institutional acceptance.
3. Performance Verification: Systematic testing of the software's scanning speed and data synchronization capabilities to ensure high performance under varied conditions.
4. Security Audit: A review of the system's login protocols and data encryption methods to verify that student violation histories are protected against unauthorized access.

### IV. RESULTS AND DISCUSSION

The analysis of the system performance and user feedback indicates that ViolaTrack successfully fulfills the technical and administrative requirements of the university. By transitioning from physical ledgers to a digital environment, the institution has established a more transparent method for student monitoring.

1. Metric Based Evaluation: Data collected using the ISO/IEC 25010 framework shows exceptional results. The system attained a total mean of 4.53, which translates to a verbal interpretation of Strongly Agree. This score confirms that the software surpasses the necessary benchmarks for functional quality and institutional adoption.
2. Reliability and Data Integrity: The categories for Security (4.65) and Reliability (4.56) emerged as the strongest attributes. These figures demonstrate that the system is capable of maintaining consistent uptime and ensuring that student disciplinary histories are protected from unauthorized tampering or data leaks.
3. Process Optimization: Feedback from security personnel and OSWD staff highlighted a significant reduction in documentation time. By utilizing QR technology, the administrative burden of manual data entry is eliminated. The automated email alerts provide a direct communication link, ensuring that students are immediately informed of their records without the delays typical of paper-based systems.
4. User Acceptance: The rating for Functional Suitability (4.46) proves that the specific features of ViolaTrack are highly relevant to the daily operations of the campus. Respondents agreed that the scannable identification and the centralized dashboard are effective tools for managing campus discipline.

**Table 2. Performance Evaluation System Tabulation**

Table	Quality Characteristic	Mean	Verbal Interpretation
1	Functional Suitability	4.46	Strongly Agree
2	Performance Efficiency	4.47	Strongly Agree
3	Usability	4.6	Agree
4	Compatibility	4.46	Strongly Agree
5	Reliability	4.56	Strongly Agree
6	Security	4.65	Strongly Agree
Over - All Mean		4.53	Strongly Agree

### V.CONCLUSION

The creation of ViolaTrack marks a vital transition toward digital governance for NEMSU Cantilan. This study successfully resolved the primary issues associated with traditional record keeping, including the loss of physical files and



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the slow pace of violation reporting. By offering a secure and centralized platform, the system provides administrators with the accurate data needed for real time oversight.

The high scores from the evaluation phase confirm that the system is ready for permanent deployment. The positive response from both the student body and the administrative staff indicates a readiness for technological integration that improves accountability. Ultimately, ViolaTrack serves as a modern framework for school discipline, replacing outdated manual methods with a reliable and efficient digital solution that supports the long-term goals of the institution.

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