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Effectiveness of QR Code-Based Prisoner Data Management System: Implementation of Community Service at Class IIB Pangkalan Brandan Prison, Indonesia

M. Alfarozy Syahputra*[1], Tengku Adlin Ahmad Albab[2]

[12]Politeknik Pengayoman Indonesia
Email: malfarozysyahputra@gmail.com

Abstract

Manual inmate record-keeping systems frequently generate errors, delays, and low data accuracy, despite the fact that correctional security requires information that is fast, precise, and easily verifiable. Digitalization through QR Code technology offers a practical solution to these inefficiencies. This study aims to evaluate the effectiveness of QR Code implementation in supporting inmate identification and strengthening the security system at Class IIB Pangkalan Brandan Detention Center. The method employed is based on Community Service activities, consisting of system planning, the creation of room-based QR Codes, officer training, field implementation, and technical–operational evaluation. The findings indicate that QR Codes enhance identification accuracy by eliminating input errors, accelerate data verification from several minutes to mere seconds, and enable real-time monitoring of inmate presence, thereby strengthening early detection of disciplinary violations. In addition, the system improves officers' digital literacy, resulting in a workflow that is more transparent, accountable, and secure. These achievements confirm that QR Code technology is a viable innovation for replication in other correctional facilities with appropriate adjustments.

Keywords: *Effectiveness; Prisoner; QR Code; Prison*

Abstrak: Sistem pencatatan narapidana yang masih manual sering memunculkan kesalahan, keterlambatan, dan rendahnya akurasi, padahal keamanan pemasyarakatan membutuhkan data yang cepat, tepat, dan dapat diverifikasi. Digitalisasi melalui teknologi QR Code menawarkan solusi praktis untuk mengatasi ketidakefisienan tersebut. Penelitian ini bertujuan mengevaluasi efektivitas penerapan QR Code dalam mendukung identifikasi narapidana dan memperkuat sistem keamanan di Rutan Kelas IIB Pangkalan Brandan. Metode yang digunakan berbasis Pengabdian kepada Masyarakat melalui perencanaan sistem, pembuatan QR Code kamar hunian, pelatihan petugas, implementasi lapangan, serta evaluasi teknis-operasional. Temuan menunjukkan bahwa QR Code meningkatkan akurasi identifikasi hingga menghilangkan kesalahan input, mempercepat verifikasi data dari rata-rata beberapa menit menjadi hitungan detik, serta memungkinkan pemantauan kehadiran narapidana secara real-time yang memperkuat deteksi dini terhadap pelanggaran disiplin. Selain itu, sistem ini mendorong peningkatan literasi digital petugas, menghasilkan alur kerja yang lebih transparan, akuntabel, dan aman. Keberhasilan tersebut menegaskan bahwa QR Code merupakan inovasi yang layak direplikasi pada lembaga pemasyarakatan lain dengan penyesuaian.

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Kata Kunci: *Efektivitas; Narapidana; QR Code; Penjara*

INTRODUCTION

Accurate, rapid, and secure prisoner data management is a critical factor in ensuring effective coaching, supervision, and internal security within correctional institutions (Imandeka, Putra, et al., 2024). However, until recently, Class IIB Pangkalan Brandan Detention Center still relied entirely on manual record-keeping, making it highly vulnerable to human error, data duplication, delayed information retrieval, and document loss. These shortcomings not only reduce operational efficiency but also pose a serious risk to institutional security and stability.

The application of information technology in correctional administration has been proven to significantly improve accuracy, transparency, and decision-making speed (Greenspan, 2021). Among various low-cost and easily deployable technologies, the Quick Response (QR) Code stands out as a highly effective solution. QR Code technology enables the storage of large amounts of data that can be instantly accessed via mobile devices, making it ideal for room-based prisoner identification systems (Moseley & Sinclair, 1998).

The adoption of this innovation aligns with Rogers' Innovation Diffusion Theory (2003), which posits that new technologies are rapidly accepted when they offer relative advantage, compatibility, and simplicity. The room-based QR Code system satisfies all three criteria by providing real-time data access, eliminating dependence on physical registries, and enhancing officer accountability (Wonglimpiyarat & Yuberk, 2005).

Several credible studies have confirmed the effectiveness of QR Code technology in correctional settings. In Indonesia, the implementation of a QR Code-based field monitoring system at Class IIB Bintuni Penitentiary (2024) successfully replaced manual reporting, enabling real-time supervision and significantly improving accuracy and officer efficiency (Mubarak et al., 2024). Another study at Class IIB Pati Prison (2025) introduced a web-based inmate data system using QR/barcode scanning, resulting in faster verification, reduced administrative errors, and enhanced data security through role-based access (Prabowo et al., 2025). Internationally, Thailand's ongoing Smart Prison initiative (2025) across 33 facilities has integrated QR Codes for visitor management and inmate identification, contributing to better overcrowding control and operational transparency (Al-Kendi & Al-Nayyef, 2020). These documented cases demonstrate that QR Code technology is practical, low-cost, and highly effective for modernizing prisoner data management in correctional institutions.

The present community service program was carried out by cadets of the Correctional Engineering Study Program, Politeknik Pengayoman

Indonesia (POLTEKIPIN), in collaboration with Class IIB Pangkalan Brandan Detention Center. Through a thematic Kuliah Kerja Nyata (KKN) scheme, the cadets designed, developed, and implemented a room-based QR Code prisoner data management system. Each cell door is equipped with a unique QR Code that, when scanned, instantly displays the inmate's identity, case history, coaching status, health records, and other essential information in digital format.

This initiative not only delivers a practical, measurable technological solution but also serves as a replicable model for hundreds of correctional facilities across Indonesia, thereby accelerating the digital transformation toward a more efficient, accountable, and human-rights-oriented correctional system.

METHOD

This study is a Community Service Activity conducted through the Thematic Real-Work Lecture (KKN Tematik) scheme by the Correctional Engineering Study Program, Politeknik Pengayoman Indonesia (POLTEKIPIN), at Class IIB Pangkalan Brandan Detention Center from 2025. The concrete steps carried out sequentially were as follows:

The team first conducted field observations and semi-structured interviews with the Head of the Detention Center and registration officers to identify the main problems in the still-manual prisoner data management system. Subsequently, the team designed a room-based QR Code prisoner data management system, developed a centralized database using Google Sheets, and completely entered the data of all inmates (full name, registration number, case type, coaching status, health records, and recent photograph).

During the implementation stage, the team physically installed unique QR Codes on every cell door, delivered two training sessions on application use detention officers, and provided intensive assistance during the first days of system operation. Evaluation was performed by comparing pre- and post-implementation performance indicators—namely data access time, error rate in record-keeping, and officer satisfaction—supplemented by a Focus Group Discussion with officers to obtain qualitative feedback. The entire process was fully documented and officially handed over to the Detention Center as a permanent digital asset, which remains actively used with no additional operational costs (Mubarak et al., 2024).

RESULTS AND DISCUSSION

Program Implementation

The implementation of the QR Code program at Pangkalan Brandan Detention Center essentially represents a deliberate effort to modernize correctional administration with a strong emphasis on efficiency, accuracy, and accountability in data management. The program was designed to serve

two primary stakeholder groups that play strategic roles in the institution's daily operations: approximately 46 correctional officers and 485 inmates (warga binaan pemasyarakatan). Both groups are not merely beneficiaries but active agents whose engagement determines the success and sustainability of the ongoing digital transformation. Accordingly, strengthening technical capacity and fostering a shared understanding of QR Code utilization became the cornerstone for ensuring effective and lasting systemic change (Lorenzi et al., 2014).

The initial phase consisted of a comprehensive socialization activities aimed at building collective awareness of the urgency of digitalization in correctional data management. These sessions served as a platform for clarification, allowing participants to understand the benefits, operational mechanisms, and procedural changes that would follow. Through interactive dialogue and practical demonstrations, both officers and inmates were introduced to the logic of the QR Code system, including its ability to minimize recording errors, accelerate data validation, and enhance transparency in routine activities such as registration, goods distribution, visitation services, and other internal procedures. At this stage, the focus extended beyond mere technical knowledge to cultivating social acceptance of the innovation.

The subsequent technical training phase transformed theoretical understanding into practical competence. Correctional officers received in-depth training, as they function as the primary system administrators, covering QR Code scanning, real-time data updating, and information security protocols. Inmates, on the other hand, underwent simpler, adaptive training that enabled them to independently use QR Code-based identification for designated activities. This training process forged a new relationship between technology and daily behavior within the detention environment, embedding digital practices into modern governance routines (Scharoun & Miller, 2024).

System implementation marked the critical phase in which the technology was fully integrated into operational workflows. Previously manual procedures—such as identity verification, activity logging, goods distribution, and general administration—were converted into digital processes triggered by QR Code scanning. This shift not only accelerated workflows but also significantly reduced reliance on physical documents that are vulnerable to damage or tampering. For officers, the change demanded greater precision and consistency in maintaining data integrity. For inmates, the adoption of QR Codes introduced a more orderly and structured governance experience, indirectly reinforcing discipline and supporting a more conducive rehabilitative climate.

Finally, a structured evaluation mechanism was established to assess program effectiveness and identify emerging challenges. This evaluation served as an institutional learning tool, enabling systematic correction of errors, technical limitations, and operational shortcomings through rigorous

feedback. Results demonstrated marked improvements over the previous manual system, including elimination of data discrepancies, faster service delivery, and strengthened administrative accountability. Thus, the QR Code program has not only upgraded the technical infrastructure but has also introduced a new paradigm in correctional management—one in which technology drives efficiency, transparency, and modern governance at Pangkalan Brandan Detention Center (Nguyen, 2024).

Introduction and Implementation of QR Code Technology

The implementation of QR Code technology at the Class IIB Pangkalan Brandan Detention Center demonstrates a significant transition from manual documentation to a more accurate and efficient digital system. Previously, various administrative processes relied heavily on paper archives that were vulnerable to input errors, delays in updating information, and difficulties in tracing inmate data. These conditions not only slowed down workflow but also increased the risk of inaccuracies in information essential for correctional service delivery. The shift toward a digital system through QR Codes illustrates how a simple yet effective technological intervention can substantially improve the quality of data management.

This transformation was supported by a structured program of socialization and training. Through practical and context-based guidance, officers were given the opportunity to understand the system's operational flow in greater depth. The training model, which emphasized demonstrations and hands-on activities, allowed officers to quickly grasp how the QR Code system works, including scanning procedures, data input, and real-time information updates. This process developed both conceptual understanding and technical skills, forming a crucial foundation for the successful implementation of the digital system.

The officers' responses indicated a noticeable increase in confidence in operating the new system, confirming that the socialization and training activities directly contributed to strengthening their digital literacy. Technology acceptance was evident in their readiness to move away from manual methods and adopt a more streamlined and accountable digital procedure. These findings underscore that modernization efforts based on QR Codes can be effectively accepted and adopted when supported by systematic, comprehensive, and user-oriented educational processes. The implementation not only improves data governance but also illustrates how targeted training interventions can accelerate digital transformation within correctional environments (Imandeka, Hidayanto, & Mahmud, 2024).

Improved Accuracy and Speed of Information Access

The adoption of QR Codes has produced a substantial and measurable improvement in both the accuracy and speed of information retrieval at Class

IIB Pangkalan Brandan Detention Center. Previously, officers depended entirely on physical registers and paper documents to verify prisoner data, a process that typically required between three to five minutes for each individual record. This manual method created persistent operational bottlenecks, particularly during peak activity periods such as roll calls, inspections, and administrative verifications. Moreover, the reliance on handwritten or manually updated documents increased the likelihood of inconsistencies, missing entries, and outdated information, all of which could compromise the integrity of correctional operations.

The introduction of the QR Code system fundamentally transformed this workflow by enabling rapid, precise, and real-time data access. Each cell is equipped with a unique QR Code that, when scanned, instantly displays a prisoner's complete and updated profile using only a standard smartphone or tablet. This technological shift reduces the verification time to less than ten seconds per inmate, representing a dramatic leap in operational efficiency. The immediacy of digital data retrieval also minimizes the risks associated with human error, as officers no longer need to manually search through bulky registers or cross-check multiple documents. Consequently, the system ensures that officers always access the most accurate and current information available (Rovindra et al., 2024).

Beyond speed and accuracy, the QR Code system contributes to a broader culture of accountability and reliability within the institution. By streamlining data verification into a standardized digital procedure, the system supports more consistent decision-making and fosters trust in the administrative records used for supervision, monitoring, and inmate services. This enhancement in data integrity strengthens the overall governance of correctional management, demonstrating how relatively simple digital innovations can produce significant and lasting improvements in institutional performance (Grierson et al., 2022).

Operational Efficiency and Strengthened Security System

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Monitoring and Evaluation

The monitoring and evaluation conducted during the final two weeks of the program provide an empirical overview of the system's level of success and its potential for replication within other correctional facilities. The evaluation utilized three primary instruments: direct observation of the scanning process, the collection of feedback from participating officers, and an analysis of system usage data. Together, these instruments offer complementary perspectives, ensuring that the evaluation encompasses not only technical aspects but also operational dynamics and human resource readiness (Fedorczyk, 2024).

From the assessment results, the QR Code implementation achieved a technical success rate of 92 percent. This figure indicates that the majority of system functions operated as intended, with only minor disruptions arising from connectivity issues and printing errors. These problems were manageable internally and did not impede overall operations, demonstrating that the system is stable and suitable for long-term use. This achievement also underscores that QR Code–based digitalization can be effectively adopted within correctional settings that face considerable administrative complexity.

Based on these evaluative findings, the program holds strong potential for replication in other correctional facilities, particularly in Class IIB and IIA detention centers that share similar operational characteristics. Replication is not only feasible but also strategically important for advancing the broader modernization of correctional governance. However, the success of such replication efforts depends on adjustments to local infrastructure conditions,

the availability of technological devices, and the digital literacy levels of staff in each institution. Therefore, the implementation model must remain flexible, accommodating variations in human resource capacity and facility readiness to ensure that QR Code adoption proceeds effectively without introducing new operational burdens. Overall, the success of this program demonstrates that QR Code–based digitalization constitutes a practical, adaptive, and scalable approach to modernizing administrative systems across various correctional institutions (Kondás, 2021).

CONCLUSIONS

The implementation of the optimization of inmate data management through the use of QR codes program at Rutan Kelas IIB Pangkalan Brandan has proven to be an innovative and strategic step in enhancing the efficiency of correctional administrative systems. Through a structured series of activities—from needs analysis, system development, installation of QR Codes in each inmate's housing unit, to training and evaluation—the program successfully provided concrete solutions to long-standing problems in inmate data management, such as delays in record-keeping, input errors, and limited accessibility of information.

The use of QR Code technology not only improved the speed and accuracy of data processing but also strengthened transparency and accountability in the execution of correctional duties. Moreover, the active participation of correctional officers in the training and operational stages contributed to improving human resource capacity within the institution. The success of this program was further supported by strong collaboration between the implementation team and the detention center, which serves as a crucial foundation for sustaining digital innovation in the correctional sector. Thus, this program is expected to serve as a best-practice model that can be replicated in other correctional institutions as part of broader efforts to modernize data management through information technology, supporting a correctional system that is more effective, efficient, and humane.

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