






Unlocking the Potential of Smart Security and Surveillance Technology in Prisons: A Brief Review



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ABSTRACT

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The surge in smart technology calls for its integration into prison security, traditionally limited in exposure to advanced tools. With the ongoing digital transformation, incorporating modern technology is essential for enhancing security measures, enabling more effective monitoring, threat detection, and overall safety for both staff and inmates in the evolving landscape of law enforcement. However, the adoption of smart technology in prison security is gaining momentum. This research adopts the Kitchenham method to investigate the complexities, obstacles, and implementation of smart security and surveillance technology in prisons. The literature review focuses on articles sourced from Scopus and Google Scholar published between 2013 and 2023, resulting in a selection of 40 relevant articles. This study emphasizes key insights into issues and challenges surrounding the adoption of prison security technology. Notable concerns include the high costs, suboptimal technological design, inadequate management, aged infrastructure, and ethical dilemmas. The research also identifies challenges related to cost-effectiveness, facility management, integration of smart systems, regulatory policies, technology acceptance, ethical considerations, and cybersecurity. Additionally, the study classifies various security and surveillance technologies used in prisons. In summary, this thorough examination of challenges in adopting prison security technology provides valuable insights, enriching the understanding of complexities in the correctional field and paving the way for informed advancements.

1. INTRODUCTION

In the ever-evolving landscape of criminal justice, the integration of smart technology within prison settings holds transformative potential, promising advancements in security, surveillance, and overall prison management. The concept of "smart technology in prison" involves harnessing digital innovations such as the Internet of Things, Data Mining, Cloud Computing, and Web 2.0 to enhance the understanding of environmental changes, identify public and community needs, and respond to demands promptly and efficiently [1]. The infusion of smart technology into prison settings heralds a transformative era. Real-time data analytics and connectivity fortify situational awareness, promptly detect anomalies, and ensure a safer environment for inmates and staff. Advanced surveillance technologies promise robust monitoring capabilities, while streamlined administrative processes and evidence-based decision-making contribute to more efficient prison management. The integration of smart technology emerges as a strategic imperative, poised to revolutionize correctional operations and address longstanding challenges within the criminal justice system.

Despite the widespread adoption of smart governance initiatives across various sectors, the integration of smart

technology in correctional facilities remains a relatively uncharted territory [2]. The current state of literature on technology in prisons is characterized by dispersion, with a predominant focus on digital technology implementation. While a substantial body of work addresses the broader context of digital technology within prisons, only a limited number of articles specifically tackle the concept of smart technology. This fragmented landscape underscores the critical need for a comprehensive examination and synthesis of existing knowledge, aiming to offer a more nuanced understanding of the potential benefits and challenges associated with the incorporation of smart technology in correctional settings. This review provides valuable insights into the nuanced aspects of smart technology, addressing issues, challenges, and implementation dynamics, particularly concerning security and surveillance in prison environments.

A thorough literature study is required to comprehend better ideas of smart technology for security and surveillance in prison [3]. This research fills a gap in the literature by investigating the concept of "smart technology in prison" within the context of smart governance. The study aims to comprehensively review existing literature to understand the evolution of discussions around smart technology in prisons, emphasizing distinctions from digital technology. It specifically explores

the benefits and challenges associated with implementing smart technology for prison security and surveillance.

2. METHODOLOGY

This study refers to the Kitchenham approach. The Kitchenham comprises three stages: planning, implementation, and reporting. In the planning stage, objectives, scope, and research questions are defined, and a review protocol is developed. The implementation stage involves executing a thorough literature search, applying predefined criteria for study selection, and rigorously assessing study quality. The reporting stage includes documenting the entire process and presenting results using concise and transparent methods. The Kitchenham approach ensures a structured and rigorous approach to systematic literature review.

In the planning stage, the protocol consists of criteria and research questions (RQ). This study uses the PICOC framework (Population, Intervention, Comparison, Outcome, and Context) formula to formulate RQ. An explanation of the PICOC framework can be seen in Table 1. According to the PICOC framework, RQ was obtained regarding smart technology definition, issues, and challenges, and implementing security and surveillance technology in prison.

Table 1. PICOC framework

Aspect	Description
Population	Prison technology
Intervention	Security and surveillance technology in prison
Comparison	n/a
Outcome	Smart technology definition, issues and challenges, and the implementation of security and surveillance technology in prison
Context	Academic and practical studies

In the implementation stage, there are two criteria for the selection process, namely inclusion and exclusion. An explanation of the inclusion and exclusion can be seen in Table 2.

Table 2. Inclusion and exclusion criteria

Criteria	Description
Databases	Scopus, Google Scholar
Searching key	(smart prison OR intelligent prison OR digital prison OR smart correctional facility OR smart detention center OR smart penal institution OR e-carceration OR e-prison OR eprison OR smart jail OR digital jail OR intelligent jail)
Inclusion Criteria	<ol style="list-style-type: none"> 1. Ranging since the study of prison technology appeared on 2013 to 2023 2. Define the term of smart technology prison 3. Explain the issue and challenge in implementing smart technology in prison 4. Outline the purposive smart technology in security and surveillance.
Exclusion Criteria	<ol style="list-style-type: none"> 1. Not journal or proceeding 2. Not full-paper version 3. Not written in English

The search strategy is structured based on selecting key terms using alternative words and synonyms in each search string. The publication search was carried out since the study of prison technology appeared, 2013 to 2023. The data source

was taken from the Scopus database and then imported into the Mendeley software. The Scopus database provides access to leading journals, conferences, and other scholarly literature. Google Scholar covers various publications from various disciplines and provides broader coverage than Scopus. At this stage, several irrelevant papers were issued based on the title and abstract. The second selection stage is performed from the appropriate paper to determine the final paper. We used item checklist to do quality test of the articles. The item checklist is provided in Table 3.

Table 3. Item checklist

No.	Item checklist
1	Does the article clearly describe the research objectives?
2	Does the article write a literature review, background and research context?
3	Does the article present related work from previous research to show the main contribution of the research?
4	Does the article describe the proposed architecture or the methodology used?
5	Does the article clearly describe issue challenges, and smart technology in security and surveillance area?
6	Does the article have research results?
7	Does the article present a conclusion that is relevant to the research objective/problem?
8	Does the article recommend future work or improvements for the future?

In the reporting stage includes documenting the entire process and presenting results using concise and transparent methods. Data were extracted by reviewing papers with annotated bibliographies. This study uses annotated bibliographic network visualization using VosViewer, a software tool that can create, visualize, and analyze bibliometric networks [4]. It uses cluster analysis and color mapping techniques to enhance the exploration of bibliographic networks. Cluster Analysis groups closely related items, revealing thematic concentrations, while color mapping assigns distinct colors to clusters or attributes. These techniques provide an intuitive visual representation of relationships, aiding researchers in identifying themes, influential works, and the evolution of research topics over time within Mendeley sources. The VOS Viewer visualization on the Kitchenham approach is a distinct technique that can be used together to enhance the effectiveness and impact of the literature review and help better understand complex relationships and patterns within the literature. The visualization of the annotated bibliography can be seen in Figure 1.

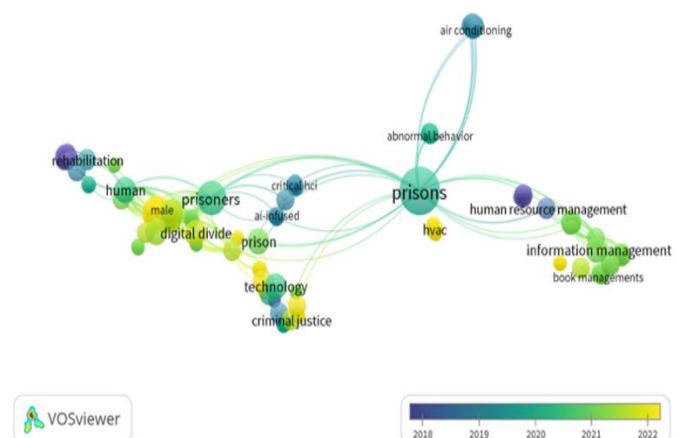


Figure 1. The visualization of the annotated bibliography

The process of analyzing the final papers uses thematic analysis techniques. Data collected from various articles were analyzed and compared systematically. The authors identified and coded the relevant data units, then grouped these codes into categories according to the scope of the research. Each theme captures the essence of the information in the data related to smart technology, the issues and challenges of smart technology, and the implementation of security and surveillance technology in prison. An explanation of the whole selection process can be seen in Figure 2.

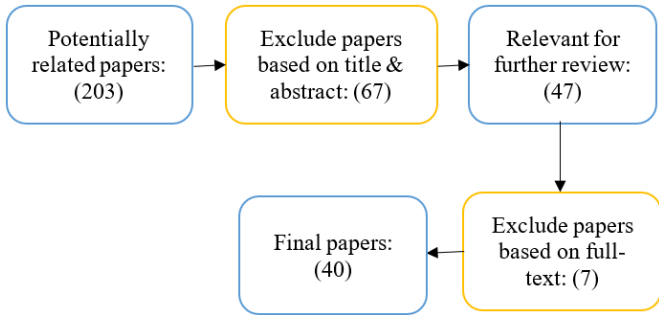


Figure 2. The selection process of Kitchenham's approach

3. RESULTS

This section will be organized into three sub-sections, each categorizing articles based on type, year, and country of distribution. This systematic categorization provides a structured approach to presenting and analyzing the distribution patterns within the literature, offering a comprehensive overview of the types of articles, their temporal distribution, and the geographical origins of the research.

3.1 Distribution of articles based on type

There are 40 articles included in this study. The included articles consist of journal papers (27), conference papers (9), and review papers (4). The details of article distribution can be seen in Figure 3.

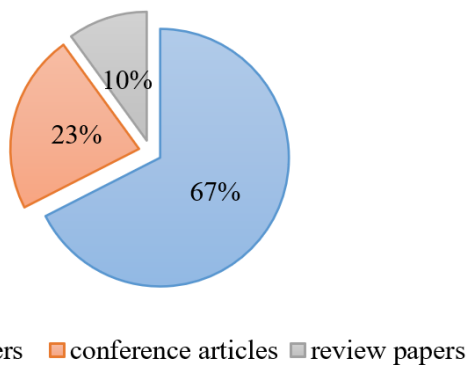


Figure 3. Articles distribution according to article type

3.2 Distribution of articles by year

Between 2013 and 2023, there is only 1 article in 2023, 14 in 2022, 12 in 2021, 5 in 2020, 4 in 2019, 2 in 2018, and only 1 in 2016 and 2015. The details of article distribution can be seen in Figure 4.

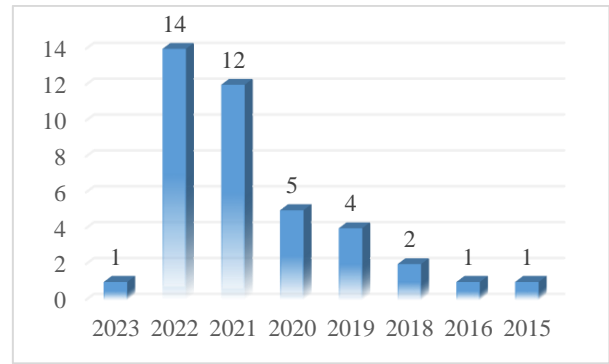


Figure 4. Articles distribution by year of publication

3.3 Distribution of articles by country

Research on the topic of smart technology in prison was most widely published in the United States with eight articles, followed by the United Kingdom with seven articles, China with six articles, Australia with five articles, Finland with three articles, Germany and Sweden with two articles, and the rest of the articles are scattered within Brazil, Hong Kong, South Korea, Spain, Switzerland, Turkey, Zimbabwe with 1 article of each country. The details of article distribution can be seen in Figure 5.

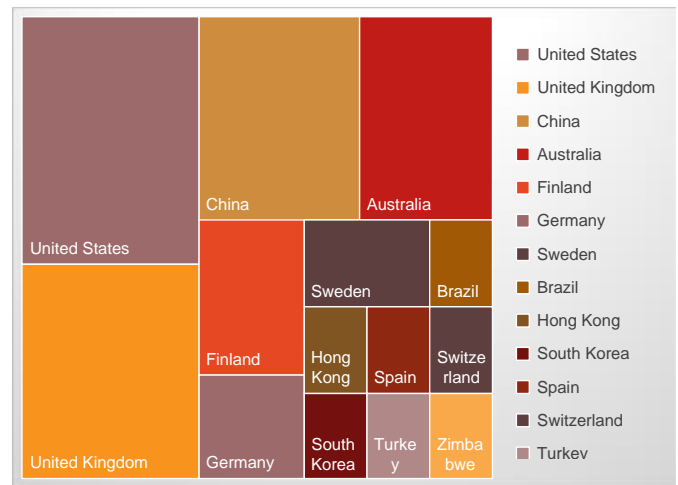


Figure 5. Articles distribution by country

The presented literature analysis, encompassing 40 articles on smart technology in prisons, provides valuable insights into the current state of research within this domain. The distribution across publication types reveals a predominant focus on journal papers, indicating a scholarly emphasis on in-depth exploration and analysis. However, the limited number of review papers suggests potential opportunities for more comprehensive and synthesized reviews of the existing body of literature. The temporal distribution highlights a recent surge in interest, particularly in 2022, indicating a growing momentum in smart technology research within prison settings. Nevertheless, the substantial gaps in certain years, such as the single article in 2015 and 2016, warrant attention. Further investigation into the factors influencing these temporal variations could illuminate evolving trends or gaps in the research landscape.

Geographically, the concentration of research in the United States, the United Kingdom, and China underscores a Western-centric perspective. While these regions may

represent prominent adopters of smart technology in prisons, there is a noticeable dearth of representation from various parts of the world. Research gaps exist in understanding the application, challenges, and implications of smart technology in diverse cultural and institutional contexts, emphasizing the need for a more globally inclusive research agenda. The implications of these findings for prison management and policymaking are noteworthy. The concentration of research in certain countries suggests that smart technology adoption and its associated challenges might differ significantly across jurisdictions. Policymakers can benefit from a nuanced understanding of regional variations to tailor effective and context-specific policies for implementing smart technology in prisons. Additionally, the emphasis on technological adoption in the United States, the United Kingdom, and China may influence the development and sharing of best practices internationally.

Future research in this field should prioritize addressing these geographical disparities, fostering a more globally representative body of knowledge. Comparative studies examining the impact of smart technology adoption in diverse prison systems could offer valuable insights into effective strategies and potential challenges. Moreover, there is a need for interdisciplinary research that considers the sociocultural, ethical, and legal dimensions of implementing smart technology in prisons. In conclusion, while the existing literature provides a foundation for understanding smart technology in prisons, it also reveals notable gaps. Bridging these gaps through comprehensive reviews, addressing temporal variations, and fostering global inclusivity in research can contribute to a more holistic understanding of the implications of smart technology on prison management and policymaking. This critical analysis serves as a roadmap for future research directions, emphasizing the importance of a nuanced, context-aware approach to advancing the field.

4. DISCUSSION

According to the results, this section will be divided into 4 (four) sub-sections related to the definition of smart technology in prison, issues and challenges of smart technology in prison, the implementation of smart technology for security and surveillance in prison, and implications of smart technology in prison.

4.1 Smart technology in prisons

Smart government entails the effective utilization of Information Technology within governmental settings. It evolved from the concept of e-government, which seeks to leverage technology to enhance the quality and efficiency of public services. These services are delivered through a well-structured, integrated system that ensures easy access and effective monitoring. While the definition of smart government is still evolving, it essentially involves employing ICT in governmental processes to foster innovation, effectiveness, efficiency, transparency, and accountability. Gil-Garcia's study further defines smart government as a progression from e-government, incorporating elements of innovation and public engagement [5, 6].

The accessibility of digital technologies and tools for inmates remains a contentious and sensitive topic. Jewkes and Johnston's research offers a historical perspective on prisons,

highlighting how restricted access portrays prisoners as secondary citizens in an era dominated by information technology, likening them to cavemen in an era of light-speed technology [7]. The current approach, limiting prisoners' access to digital tools and the Internet, further widens the gap between prison and society [8]. In an age where access to technology and the Internet is crucial, denying prisoners these resources deprives them of essential advancements and educational opportunities available to the general populace. This deprivation not only exacerbates social isolation but also impedes their reintegration into society post-release. Knight's work [9] provided insights into how the withdrawal of technology can impact prisoners' relationships with others, giving voice to their experiences. In recent discourse, an increasing number of researchers advocate for a digital transformation within prisons, advocating for prisoners' participation in this process. In many modern societies, digital technologies serve as the primary means of communication with the outside world, highlighting their importance [10]. Several countries have begun implementing and developing digital self-service systems in prisons, viewing it as part of a broader digitalization trend or as a feature of smart cities [11].

The digitization process influences the dynamics of interactions and relationships among staff and inmates, along with reshaping staff roles and the broader prison culture [5, 12]. It's imperative for correctional facilities to introduce targeted digital transformation initiatives, guided by thorough needs assessments and collaborative networking across organizations [12]. Effective digital projects must navigate potential risks, fully leverage the benefits of digitization, and demonstrate measurable effectiveness. Aldhaheri and Xia's research [13] highlighted the anticipated hurdles in integrating smart technology within prison infrastructures and underscored the essential considerations prior to adopting intelligent technologies. They reveal that while installing smart technology in prison, the authority should consider its durability, high labor efficiency, safety, and security features [14]. Kaun and Stiernstedt [15] examined the benefits and drawbacks of intelligent technology in prisons. Digital technology in smart prisons includes both systems that can help prisoners by giving them access to services and systems built into the prison's infrastructure to benefit the authorities through security features [16]. However, more must be done before prisons can offer the same degree of digital services as smart government. Using the intelligent government model to develop smart prisons would be perfect. Correctional facilities should strive to keep pace with digitally advanced institutions like schools, hospitals, and the military. Authors contend that integrating smart technologies for inmates can enhance security and surveillance measures [12]. Our study addresses this research gap by offering valuable insights into the complexities and obstacles associated with implementing security and surveillance technologies within prisons.

A novel approach termed "smart" seeks to enhance daily experiences by merging physical and digital components through embedded sensors that interface with intelligent devices [17]. This paradigm shift, as described by IBM, involves a thorough examination of our activities using big data to promote productivity and enrich our lifestyles [17]. The integration of supercomputers and cloud computing facilitates this connectivity, linking everything through the Internet of Things. Within correctional settings, smart technology represents a pioneering concept that emphasizes digital services aimed at rehabilitation, education, and social

reintegration. This approach acknowledges the importance of rehabilitation initiatives that strive to disrupt the cycle of crime by reshaping offenders' mindsets, attitudes, and behaviours [18]. According to Lindström and Puolakka [19], smart prison is defined as cutting-edge technology to reduce recidivism rates and facilitate successful reintegration while being cost-effective and therapeutic. Some correctional industries try to define the concept of a smart prison by approaching smart prison as a method for increasing operational efficiency, visibility to critical data, and leveraging technology to improve organizational operations dramatically. Smart prisons use digital technology to improve management, reduce costs, and increase safety and security [20]. Smart prisons use technologies such as biometrics, radio frequency identification (RFID), and artificial intelligence (AI) to manage prisoners, reduce the workload of prison staff, and improve safety and security. It may also use digital technologies to educate and train prisoners and help them prepare for reintegration into society after release. The concept of a smart prison revolves around establishing a secure and humane setting for inmates, personnel, and visitors alike. Smart prisons seek to enhance the correctional system by leveraging technology and data to gain deeper insights into and effectively manage the dynamics among prisoners, staff, and visitors. This approach aims to not only minimize costs and enhance public safety but also to bolster security measures to deter repeat offenses, facilitate successful reintegration into society, and foster a shift away from recidivism culture.

Table 4. Issues on smart technologies in prison

Issues	References
High cost of smart technology	[13, 15, 16, 21-23]
Ineffective design of technology	
Long process of implementing smart technology	
Poor management of facilities	[13, 14, 24, 25]
Lack of local standards for smart technology	
Lack of training program for prison officer	
Lack of experts	
Ethical Concerns	[12, 13, 15, 16, 26, 27]
Aging facilities	

4.2 Issues and challenges on smart technology in prisons

In recent years, the perception of prisons has shifted towards emphasizing their role in separating individuals from society rather than solely as places of punishment. The primary aims of prisons now include correcting behavior, preparing inmates for successful reintegration into society, and reducing recidivism rates. There is a growing movement advocating for the use of digital technology to afford inmates access to education, communication, leisure activities, and opportunities for personal growth, including technological resources. Such technology aids in the delivery of rehabilitation programs, enhances access to healthcare services, and facilitates secure communication with family members outside the prison walls. However, despite the availability of various technological solutions, the adoption of technology in prisons remains relatively slow and often premature. Many current implementations fall short of achieving true digital transformation within correctional systems. Given the crucial role prisons play in society, further

research is needed to explore how prison staff can effectively leverage technology to improve their operations. Details outlining the challenges associated with implementing smart technologies in prisons can be found in Table 4.

Ensuring prison security is a challenging matter. There are several challenges associated with implementing smart technology in prisons. Some of these challenges are highlighted below:

(1) Cost: Integrating smart technology into prisons can pose substantial financial obstacles, particularly for developing nations. The expenses associated with acquiring and sustaining these technologies often present a formidable challenge [13, 15].

(2) Technological Constraints: Smart technology in prisons may be limited by the availability of the necessary technological infrastructure. The need for appropriate technology infrastructure, including power, connectivity, and hardware, can affect the implementation of smart technology in prisons [13, 26].

(3) Privacy and Ethical Issues: Using technology in prisons raises concerns about privacy and ethical issues. Surveillance and monitoring devices can infringe on prisoners' privacy rights and dignity, leading to ethical concerns [16, 28].

(4) Cybersecurity threats: Smart prison technology can be vulnerable to cyber-attacks, leading to data breaches and security threats. It is necessary to implement appropriate cybersecurity measures to protect the prison's critical data and systems [29].

(5) Resistance to change: Implementing smart technology in prisons can be met with resistance from prison staff and management. The staff may fear job loss or reduced job security due to automation, while management may be hesitant to invest in new technologies [12, 15, 27, 30, 31].

Table 5 provides a comprehensive overview of the hurdles encountered in the deployment of smart technologies within prisons.

4.3 Implementation of smart technology for security and surveillance in prisons

Table 5. Challenges on smart technology in prison

Challenges	References
Cost efficiency for smart technology	[13, 15]
The compatibility of existing buildings with smart technologies	[13]
Regulatory policy and local standards for smart technology	[13, 26]
Integration of the prison system into smart technology	[2, 13, 16, 19, 22-25, 32-35]
Automated administration	[15]
Technology ethics	[16, 28]
Changing the behavior of prisoners	[12, 22-24, 28, 33-36]
Technology acceptance for officer and prisoner	[16, 22, 25]
Cybersecurity threats	[37]

In the United States, Europe, and Australia, there is a burgeoning interest in modernizing prison environments through the integration of digital technology and tablet computers [38, 39]. Discussions have revolved around the potential benefits of introducing digital self-service devices to empower prisoners with more control over their lives while incarcerated. Over the years, sensor network solutions have been employed for monitoring and security purposes in

prisons. A variety of technologies are employed across administration, security, and prisoner education, showcasing the adoption of intelligent technology in prison operations [40]. Examples include the utilization of IoT in monitoring systems, which integrate data into global monitoring platforms via wireless sensor networks and cloud computing, as well as the deployment of video surveillance and analytics systems, digital self-service devices, among others. These advancements underscore the increasing utilization of smart prison technology to streamline existing processes and address challenges within prison settings [41].

The predominant focus of applications within prison environments revolves around security and surveillance [42-44], particularly evident in Asian countries like China. Here, sophisticated surveillance systems are implemented to continuously monitor inmates, even within their cells [45-47]. Through a network of cameras and sensors, inmates' movements are tracked in real-time and integrated into an artificial intelligence framework, employing facial recognition and motion analysis technologies. This enables the generation of daily activity reports for each prisoner and the identification of any aberrant behavior [18]. Similar surveillance systems are also deployed in Hong Kong, utilizing cameras equipped with analytical monitoring capabilities to detect anomalies such as self-harm or loss of consciousness among inmates, with the capability to promptly alert officers [45]. Another application

makes use of data obtained from tracking bracelets. This wearable bracelet will track prisoners' vital signs and whereabouts, including biometric data and early warning signs, such as signs that they may have injured themselves [47]. Robots monitor prisoner violence and suicide risk in South Korea to help reduce the workload of human guards. Robotic arms that move on the feces of prisoners are also used in Hong Kong prisons to inspect contraband such as drugs. An additional instance of advanced security technology within prisons is exemplified by a comprehensive monitoring system for inmates' phone communications in US prisons [18]. This system utilizes speech recognition, semantic analysis, and machine learning algorithms to compile a database of keywords capable of identifying potentially concerning calls, such as discussions involving criminal activities like conspiracy or contraband smuggling. Furthermore, technologies like image and pattern recognition, exemplified by AI-driven video analysis platforms currently in use in select prisons, are increasingly integrated into CCTV surveillance systems. Notably, Liverpool prison incorporates security cameras equipped with artificial intelligence to deter illicit activities such as drug, contraband phone, and weapon smuggling, as well as to identify other suspicious behaviors [48]. Additional insights into the implementation of smart security and surveillance technologies in prisons are detailed in Table 6.

Table 6. Security and surveillance technology in prison

Domain	Smart Technology	Country	
Security	Face recognition [16]	Australia	
	Smart sensor [15]	Sweden	
	Fire sensor [13, 14]	United Arab Emirates	
	Building automation system [14, 15]	Sweden, United Arab Emirates	
	Robot wardens [16]	Australia	
	Recommender system [15, 28, 49]	Sweden, United Kingdom, United States	
	Cybersecurity [29, 50]	United Kingdom, Australia	
	Surveillance	Advanced information system [14, 15, 16]	United Arab Emirates, Sweden, Australia
		Healthcare system [15, 23]	Sweden, Australia
		Smartphone [22, 23, 26]	Nigeria, Australia, Namibia
Digital self-service [15, 16, 19]		Sweden, Australia, Finland	
Digital participation [27]		Germany	
Alert system [15, 28, 49]		Sweden, United Kingdom, United States	
Digital rehabilitation [16, 19, 33, 34]		Australia, Finland, United States, Sweden	
Artificial Intelligence [15]		Sweden	
Building management [14]		United Arab Emirates	
Video surveillance [14, 16, 28, 51]		United Arab Emirates, Australia, United Kingdom	
Tracking wristbands [15, 16]	Sweden, Australia		
Heat, ventilation, and air-conditioning system [14]	United Arab Emirates		
Energy and sustainability system [14]	United Arab Emirates		
VR-technology [32]	Greece		
Data sharing [15]	Sweden		
Phone calls analytics [15]	Sweden		
Video analytics [15, 16, 36, 52, 53]	Sweden, Australia, Germany, China, India		

The use of smart technology has brought revolutionary changes in security and surveillance fields. The use of smart cameras and smart sensors can help increase the effectiveness of surveillance [15]. With motion detection and facial recognition capabilities, smart cameras can automatically identify suspicious activity or unwanted individuals and immediately notify security guards [16]. This enables a fast and timely response to potential threats. Furthermore, intelligent data analysis systems can integrate and analyze data from multiple sources, such as cameras, sensors, and other security systems. Using artificial intelligence, the system can

identify suspicious behavior patterns, highlight vulnerable points, and provide early warning of potential security risks [15]. Internet of Things (IoT) networks can enhance security and surveillance. Connecting security devices, such as motion sensors, alarms, and smart door locks, to a centralized network allows systems to be managed and monitored remotely [16]. It allows users to easily control and monitor the security of their home or workplace through a mobile app or other device. The biometric recognition technology can also be integrated into security and surveillance systems [16]. Using fingerprints, retina scanning, or facial recognition can help ensure more secure and controlled access to restricted areas. With this

technology, individual identities can be verified accurately, reducing security risks related to stolen access cards or passwords. Finally, strong cybersecurity must complement intelligent security and surveillance systems [37]. Protecting data and networks from cyber threats like hacking or malware is critical in this digital era. Therefore, sophisticated, and constantly updated cybersecurity technologies must be integral to any implemented smart technology solution. In conclusion, smart technology offers great potential to enhance security and surveillance systems. By leveraging smart cameras, smart data analytics, IoT networks, biometric recognition, and cybersecurity, we can create a safer and more secure environment in prison. However, it is essential to remember that these technologies must also be managed with proper ethics and privacy, so that we can harness their potential without compromising fundamental human rights values.

4.4 Implications of smart technology in prisons

The exploration of the ramifications of smart technology in prison will occur within three primary areas: Ethical Contemplations, Prison Administration, and Policy Development. The infusion of smart technology into prison environments introduces a nuanced spectrum of ethical considerations that demand careful examination [15, 54]. A critical aspect involves intricately addressing privacy concerns intertwined with surveillance and data collection. Achieving a delicate balance between the imperatives of security and the preservation of individual privacy rights emerges as a pivotal challenge. Additionally, the proactive ethical stance required for deploying biometric systems aims to identify and mitigate potential biases, ensuring fair and equitable treatment of inmates.

The transformative impact of smart technology on prison management unfolds across multiple facets, with security enhancement as a foundational element. Real-time monitoring, automated threat detection, and responsive systems collectively bolster the safety and security of prisons [45, 46, 53, 55, 56]. Simultaneously, smart technology acts as a catalyst for resource optimization, automating routine tasks, streamlining operations, and empowering prison staff to engage in more intricate aspects of their roles. This not only elevates overall operational efficiency but also fosters a judicious and strategic use of personnel and resources.

The integration of smart technology necessitates a dynamic and adaptive approach to policymaking [13, 57]. Policymakers grapple with the challenge of aligning legal frameworks with the rapid evolution of technology, necessitating continuous updates to address emerging challenges and evolving ethical considerations. The data-rich environment fostered by smart technology becomes a cornerstone for evidence-based policymaking. Policymakers can leverage these insights to craft informed and responsive policies, spanning correctional practices, rehabilitation initiatives, and holistic inmate management. The overarching goal is to strike a delicate equilibrium, harnessing the transformative potential of technology while upholding ethical principles and ensuring the resilience and efficacy of correctional policies.

5. CONCLUSIONS

This study significantly enriches the corrections field by

conducting a thorough review of security and surveillance technology in prisons. It articulates the concept of a smart prison, aligning the contemporary demand for smart technology with overarching objectives encompassing security, and surveillance. The analysis uncovers multifaceted challenges inherent in implementing smart technology in prisons, spanning from cost considerations and technological design inadequacies to issues of expertise, facility management, staff training, and the strain of accommodating expanding prisoner populations. Policy creators and professionals can glean valuable understandings from this research to guide strategic decision-making and resource distribution for incorporating intelligent technology in prisons. The results endorse crafting policies that carefully address cost-effectiveness, ethical concerns, and the smooth integration of technology. Policymakers are encouraged to focus on crafting regulatory frameworks that not only facilitate the adoption of technology but also uphold ethical principles and ensure robust cybersecurity measures. Additionally, investing in comprehensive staff training programs and cultivating technological expertise within prison administrations emerges as crucial for the successful deployment of smart technology. While this study offers valuable insights, it acknowledges certain limitations. The selection process for articles may have benefited from a more rigorous approach, potentially impacting the comprehensiveness of the findings. It is essential to recognize that the chosen papers and references, while meeting required standards, may not capture the entire spectrum of the evolving landscape of smart technology in prisons. Future research in this domain should delve deeper into the policy and ethical dimensions surrounding smart technology in prisons. Exploring critical factors influencing the acceptance of smart technology within prison environments presents an avenue for further investigation.

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