

Exploring the Role of Barangay CCTV Operations in Crime Prevention and Emergency Response: A Qualitative Study in Mandaluyong City

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Abstract

This study explored the role of barangay Closed-Circuit Television (CCTV) operations in crime prevention and emergency response in selected barangays in Mandaluyong City. Anchored on Rational Choice Theory, Routine Activity Theory, and Systems Theory, the study examined how CCTV systems influence offender behavior, strengthen guardianship, and support coordination among barangay officials, CCTV operators, law enforcement agencies, emergency responders, and community members. The study employed a qualitative research design using a phenomenological approach. Ten participants, consisting of barangay officials, CCTV operators, barangay tanods, and residents, were selected through purposive sampling. Data were gathered using a validated semi-structured interview guide and analyzed through Colaizzi's phenomenological method. Findings revealed that barangay CCTV systems improved monitoring, situational awareness, perceived safety, investigation, evidence gathering, accountability, transparency, and emergency response coordination. However, their effectiveness was limited by low-resolution cameras, unclear nighttime footage, unstable connectivity, power interruptions, absence of backup systems, limited personnel, insufficient training, funding constraints, weak coordination, privacy concerns, and unclear access protocols. The study concludes that CCTV systems are most effective when supported by reliable infrastructure, active monitoring, trained personnel, adequate funding, clear operational procedures, transparent governance, community trust, and integration with crime mapping and policing strategies. The study aligns with SDG 9, SDG 11, SDG 16, and SDG 17 by supporting technological infrastructure, safer communities, accountable institutions, and inter-agency partnerships. Its sustainability impact lies in strengthening public safety, technology governance, community trust, policy development, and sustainable barangay-level security operations.

Keywords: Barangay CCTV Operations, Community Safety, Crime Mapping, Crime Prevention, Emergency Response, Governance, Mandaluyong City, Public Trust, Surveillance Technology, Technological Reliability

1. Introduction

Closed-Circuit Television (CCTV) systems have become important tools in modern public safety, crime prevention, emergency response, and local governance. In urban communities, particularly in densely populated areas, CCTV systems support monitoring, deterrence, evidence gathering, and faster response to incidents. At the barangay level, these systems are especially relevant because barangays serve as frontline units in maintaining peace and order, responding to emergencies, and coordinating with law enforcement agencies. However, the effectiveness of barangay CCTV operations depends not only on the presence of cameras but also on system reliability, active monitoring, trained personnel, sufficient funding, operational protocols, stakeholder coordination, privacy safeguards, and community trust.

This study explores the role of barangay CCTV operations in crime prevention and emergency response in Mandaluyong City. It focuses on the experiences, challenges, and insights of barangay officials, CCTV operators, and community members. By using a qualitative approach, the study addresses the limited understanding of how CCTV systems function in actual barangay settings and how stakeholders perceive their effectiveness, limitations, and sustainability.

The rapid advancement of surveillance technologies has reshaped public safety strategies in urban environments. CCTV systems have become widely used for monitoring public spaces, deterring criminal activities, supporting investigations, and enhancing emergency response. Governments have adopted these systems as part of broader efforts to strengthen crime prevention and community safety, especially in densely populated cities where crime risks and emergency incidents are more common (Piza et al., 2020). In the Philippine context, CCTV implementation has expanded from national and city-level security initiatives to barangay-level operations. Barangays, as the smallest units of local governance, play a critical role in maintaining peace and order, enforcing local ordinances, and coordinating emergency responses. The integration of CCTV systems into barangay operations reflects a shift toward technology-driven governance, where local authorities use surveillance systems to improve monitoring and responsiveness. Barangay CCTV systems serve several functions. They deter potential offenders by increasing the perceived risk of detection, assist law enforcement by providing visual evidence

for investigations, and enable real-time monitoring for faster emergency response. However, their effectiveness varies depending on technical quality, operational management, monitoring practices, and stakeholder engagement (Caplan et al., 2021). While many studies have examined CCTV effectiveness through crime rates and response times, fewer studies have explored the lived experiences of barangay officials, CCTV operators, and residents who directly interact with these systems. In Mandaluyong City, barangay-operated CCTV systems contribute to maintaining safety and order amid urban density and socio-economic diversity. However, limited qualitative research has examined how these systems are experienced in practice, what operational challenges are encountered, and what improvements may enhance their effectiveness. This study therefore explores the challenges, experiences, and insights related to barangay CCTV operations in crime prevention and emergency response.

Related literature shows that CCTV systems contribute to crime prevention by increasing surveillance visibility and raising the perceived risk of detection among offenders. This supports the assumptions of Rational Choice Theory, as offenders may avoid committing crimes when they perceive a higher likelihood of being identified or apprehended (Piza et al., 2020; Welsh et al., 2020). However, the deterrent effect of CCTV is not uniform, as studies indicate stronger effects on property-related crimes than on violent offenses (Lim & Wilcox, 2021). This suggests that CCTV effectiveness is context-dependent and influenced by environmental, situational, and operational conditions. Technological reliability is a major factor in CCTV effectiveness. Poor image resolution, system downtime, limited storage, weak connectivity, and lack of maintenance reduce the usefulness of CCTV systems for prevention, investigation, and response. Yang et al. (2024) found that poor image resolution, system downtime, and lack of maintenance significantly reduced surveillance reliability. Ashby (2021) and Welsh et al. (2020) also emphasized that malfunctioning or low-quality systems weaken both deterrence and evidentiary value. These findings indicate that CCTV systems cannot function effectively without adequate infrastructure and maintenance. Operational systems and monitoring practices also influence CCTV outcomes. Welsh et al. (2020) emphasized that real-time monitoring improves crime prevention, while passive systems are often limited to post-incident review. Ratcliffe et al. (2020) noted that CCTV systems must be connected to response mechanisms to support immediate intervention. Studies on data-driven policing further show that surveillance technologies are more effective when embedded in operational frameworks involving monitoring, communication, and response coordination (Braga et al., 2021; Chainey et al., 2022). Human resource capacity is equally important. CCTV operations require trained personnel who can interpret footage, detect suspicious activity, assess incidents, and coordinate responses. Caplan et al. (2021) and Chainey et al. (2022) highlighted that trained personnel are essential for interpreting surveillance data, identifying threats, and initiating responses. Operator competence directly affects detection accuracy, situational awareness, and decision-making (Piza et al., 2020; Ratcliffe et al., 2020). Funding and resource allocation also shape CCTV sustainability. Afzal (2024) and Sukor (2024) emphasized that limited funding restricts maintenance, expansion, and technological upgrades. Underfunded systems often experience reduced reliability and weaker preventive impact (Piza et al., 2020; Kitchin, 2021). From a Rational Choice perspective, poorly maintained systems may reduce the perceived risk of detection, thereby weakening deterrence. Governance, transparency, privacy, and public trust are also central concerns. Taylor (2021) emphasized that transparency and accountability help build trust in surveillance systems, while Kaufmann and Peil (2020) noted that privacy concerns affect public perception. Research in digital governance suggests that clear policies, ethical data management, and stakeholder engagement improve both legitimacy and effectiveness (Kitchin, 2021; Afzal, 2024). The literature also highlights the value of integrating CCTV systems with crime mapping and intelligence-led policing. Braga et al. (2021) and Ratcliffe et al. (2020) emphasized that combining CCTV data with geographic information systems improves hotspot identification and resource allocation. Chainey and Ratcliffe (2021) further explained that crime mapping supports predictive policing and strategic decision-making, transforming CCTV systems from passive surveillance tools into active components of data-driven policing.

Globally, CCTV systems have been adopted as part of modern crime prevention strategies intended to reduce criminal opportunities and strengthen public safety. Research shows that surveillance technologies can deter certain types of crime, particularly property-related offenses, although their effectiveness depends on implementation quality, environmental context, and operational practices (Lim & Wilcox, 2021). In developing countries, including the Philippines, CCTV systems have been influenced by increasing urbanization, crime risks, and emergency response demands. Local government units use CCTV systems to monitor streets, public facilities, and high-risk areas, thereby supporting localized crime prevention and emergency response. However, several challenges affect effectiveness, including poor image quality, system malfunction, limited storage capacity, insufficient funding, lack of trained personnel, and weak coordination with law enforcement agencies. Privacy and data protection concerns also influence public acceptance. In the Philippine barangay context, CCTV systems are widely used as part of community-based crime prevention strategies (Dela Cruz, 2021; Mendoza, 2022). Local literature shows that these systems support monitoring, deterrence, and emergency response. However, Dizon et al. (2021) reported technical issues such as poor maintenance and system malfunction, while Reyes and Santos (2022) identified operational gaps due to the lack of continuous monitoring. Human resource limitations are also evident, as many barangays lack trained personnel to manage CCTV systems effectively (Bautista, 2023). Funding constraints further affect maintenance, expansion, and sustainability (Reyes & Santos, 2022). Local studies also show that CCTV systems influence community perception. Garcia (2022) found that while CCTV systems improve perceived safety,

concerns about privacy and data access affect public acceptance. Mendoza (2022) highlighted the potential of CCTV systems in crime mapping, although their integration with formal analytical systems remains limited. These findings suggest that barangay CCTV systems can strengthen local security, but their value depends on implementation quality, governance, technical capacity, and public trust.

This study is anchored on Rational Choice Theory, Routine Activity Theory, and Systems Theory. These theories collectively explain how CCTV systems influence offender behavior, environmental conditions, and emergency coordination. Rational Choice Theory explains that individuals make decisions based on perceived risks and benefits. The presence of CCTV systems increases the perceived likelihood of detection, which may discourage criminal behavior (Piza et al., 2020). In this study, CCTV systems are viewed as deterrent mechanisms that influence offender decision-making by increasing the perceived cost of committing crime. Routine Activity Theory emphasizes that crime occurs when a motivated offender, a suitable target, and the absence of a capable guardian converge. CCTV systems function as capable guardians by increasing surveillance visibility, reducing opportunities for crime, and supporting the detection of suspicious activities (Caplan et al., 2021). In barangay settings, CCTV systems may strengthen guardianship when they are actively monitored and linked to response mechanisms. Systems Theory explains CCTV operations as part of an interconnected network involving barangay officials, CCTV operators, law enforcement agencies, emergency responders, and community members. CCTV systems facilitate coordination, communication, and response efficiency when different actors work together effectively (Kaufmann & Peil, 2020). This theoretical perspective is relevant because barangay CCTV effectiveness depends not only on technology but also on people, policies, protocols, resources, and institutional coordination.

Existing studies provide valuable evidence on CCTV effectiveness, particularly in relation to crime prevention, surveillance visibility, and response improvement. Foreign empirical studies show that CCTV systems can reduce crime, especially when actively monitored (Piza et al., 2020). Braga et al. (2021) found that integration with hotspot policing improves outcomes, while Ratcliffe et al. (2020) showed that combining CCTV data with crime mapping improves resource allocation and response efficiency. Yang et al. (2024) also highlighted the role of smart surveillance in strengthening situational awareness. However, limitations remain, including inconsistent effects on fear of crime and dependence on implementation quality (Tykesson, 2025; Solymosi et al., 2021). Local studies similarly establish the importance of CCTV systems in barangay-level crime prevention and community security (Dela Cruz, 2021; Bautista, 2023). These systems improve surveillance coverage, visibility in public spaces, and informal and formal social control. However, local studies also identify persistent problems involving system maintenance, personnel capability, operational integration, privacy, data security, and trust. Mendoza (2022) emphasized the role of CCTV in crime mapping and spatial analysis, while Garcia (2022) highlighted mixed stakeholder perceptions due to privacy and data access concerns. Despite these contributions, most studies rely on quantitative approaches and do not fully capture the lived experiences of stakeholders. There remains limited qualitative research on how barangay CCTV systems are implemented, experienced, managed, and accepted at the community level. This gap justifies the present study, which provides a theme-based qualitative analysis of barangay CCTV operations in Mandaluyong City. The study focuses on stakeholder experiences, operational challenges, and practical insights to support more effective, sustainable, and acceptable CCTV operations.

This study aligns with SDG 11 – Sustainable Cities and Communities because it focuses on improving community safety, emergency response, and barangay-level security systems in an urban setting. By examining CCTV operations in Mandaluyong City, the study contributes to discussions on safer, more responsive, and more resilient communities. The study also supports SDG 16 – Peace, Justice, and Strong Institutions because it addresses crime prevention, public safety, governance, accountability, privacy, public trust, and coordination between barangays and law enforcement agencies. CCTV systems, when properly managed, may strengthen institutional capacity, improve evidence-based response, and support transparent community safety operations. The study is also connected to SDG 9 – Industry, Innovation and Infrastructure because it examines the use of surveillance technology as part of local public safety infrastructure. Its focus on system reliability, maintenance, monitoring, and integration with crime mapping reflects the role of technological infrastructure in improving local governance and security operations. Finally, the study relates to SDG 17 – Partnerships for the Goals because effective CCTV operations require coordination among barangay officials, CCTV operators, law enforcement agencies, emergency responders, policymakers, and community members. The literature emphasizes that CCTV systems are most effective when supported by technology, human resources, management practices, governance structures, and data-driven policing strategies (Piza et al., 2020; Braga et al., 2021; Ratcliffe et al., 2020).

The study contributes to multidisciplinary sustainability by linking criminology, public administration, technology governance, community safety, emergency response, urban management, and policy development. From a public safety sustainability perspective, it examines how barangay CCTV systems may support crime prevention, incident detection, evidence gathering, and emergency response. From a technological sustainability perspective, it highlights the need for reliable infrastructure, regular maintenance, trained operators, and integration with crime mapping and intelligence-led policing. From a policy and governance sustainability perspective, the study emphasizes transparency, accountability,

privacy protection, data management, funding, and operational protocols. These areas are important because CCTV systems may lose public trust if they are poorly managed or perceived as intrusive. From a community sustainability perspective, the study considers how CCTV systems affect perceived safety, public trust, and resident participation in barangay security efforts. Overall, the study is important because it moves beyond measuring CCTV effectiveness through numerical crime reduction alone. It provides qualitative insight into how CCTV systems operate in real barangay settings, how stakeholders experience them, and what improvements are needed to make surveillance systems more effective, sustainable, ethical, and acceptable within local communities.

2. Material and methods

2.1 Research Design

The study employed a qualitative research design using a phenomenological approach. This design was appropriate because the study aimed to explore the lived experiences, perceptions, challenges, and insights of stakeholders regarding the implementation and utilization of barangay CCTV systems. Specifically, the study followed a descriptive phenomenological tradition, which allowed the researcher to capture the essence of participants' experiences without imposing preconceived assumptions. Through this approach, the study examined how CCTV systems were used in practice, how stakeholders experienced their benefits and limitations, and how these experiences contributed to crime prevention, emergency response, crime mapping, and decision-making processes.

2.2 Locale of the Study

The study was conducted in selected barangays in Mandaluyong City. These barangays were chosen because they were directly involved in or affected by barangay CCTV operations used for crime prevention, emergency response, and community safety. The setting provided relevant context for examining how surveillance systems functioned at the local governance level and how these systems were experienced by barangay officials, CCTV operators, barangay tanods, and residents.

2.3 Respondents of the Study

The respondents were key stakeholders involved in or affected by barangay CCTV operations. They included barangay officials responsible for policy implementation and decision-making, CCTV operators assigned to monitor surveillance systems, barangay tanods who supported peacekeeping and emergency response, and selected residents who experienced the presence of CCTV systems in their community. The respondents varied in age, gender, and years of experience, allowing the study to gather diverse perspectives on CCTV operations, community safety, public trust, and local security practices.

2.4 Sample and Sampling Procedure

The study used purposive sampling to select participants who could provide rich and relevant information about barangay CCTV operations. This non-probability sampling technique was appropriate for the qualitative nature of the study because it allowed the researcher to intentionally choose individuals with direct knowledge or experience related to CCTV systems and community safety. The study targeted ten participants, which was considered sufficient to reach data saturation. Data saturation was achieved when no new themes or insights emerged from the interviews.

2.5 Research Instrument

The primary research instrument was a semi-structured interview guide composed of open-ended questions. The guide was designed to elicit detailed responses regarding participants' experiences, challenges, insights, and recommendations related to CCTV systems. The questions were aligned with the study's statement of the problem and focused on challenges in CCTV implementation and operation, stakeholder experiences, insights on effectiveness, and recommendations for improvement. Follow-up and probing questions were also included to clarify responses and obtain deeper insights. The interview guide underwent validation to ensure relevance, clarity, and alignment with the objectives of the study. The initial draft was developed based on the statement of the problem and reviewed literature, then submitted to the research adviser for evaluation. The adviser reviewed the clarity, language, sequencing, and alignment of the questions with the qualitative research design. Subject matter experts in criminology and research methodology also reviewed the instrument to establish content validity. A pilot interview was conducted with selected individuals who were not included in the final sample, and the feedback was used to refine the guide before actual data collection.

2.6 Data Gathering Procedure

The data gathering process followed a systematic procedure to ensure the validity and reliability of the collected data. Permission was first secured from barangay officials before the conduct of the study. After approval was obtained, participants were identified based on the inclusion criteria and were informed about the purpose of the research. Informed consent was secured before the interviews, ensuring that participation was voluntary and that participants understood their rights, including confidentiality and the option to withdraw at any time. The interviews were conducted either face-to-face

or through online platforms, depending on participant availability. Each interview lasted approximately 30 to 60 minutes and was audio-recorded with the consent of the participants. Field notes were also taken to document non-verbal cues and contextual information. After the interviews, the recordings were transcribed verbatim and reviewed before data analysis. To strengthen trustworthiness, the study applied credibility, transferability, dependability, and confirmability through member checking, rich contextual description, consistent procedures, an audit trail, careful documentation, and reflexive analysis.

2.7 Data Analysis Techniques

The study used Colaizzi's (1978) phenomenological method of data analysis. This method was appropriate for identifying themes and extracting the essence of participants' experiences. The analysis began with repeated reading of the interview transcripts to gain a general understanding of the data. Significant statements related to the research questions were then identified and extracted. Meanings were formulated from these statements, and similar meanings were grouped into clusters of themes. The themes were organized according to the major areas of the study, namely challenges, experiences, insights, and recommendations. These themes were further analyzed in relation to crime prevention, emergency response, and crime mapping to provide a comprehensive understanding of barangay CCTV operations. The findings were validated through member checking, where selected participants reviewed the interpretations to ensure accuracy and credibility.

3. Results and Discussion

3.1 Challenges in the Implementation and Operation of Barangay CCTV Systems

3.1.1 Technological Limitations and System Reliability Issues

The findings revealed that technological limitations significantly affected the effectiveness of barangay CCTV systems. Participants identified low-resolution cameras, unclear nighttime footage, unstable internet connectivity, power interruptions, and the absence of backup systems as major concerns. These issues limited the ability of CCTV systems to identify suspects, sustain continuous monitoring, and provide reliable evidence during investigations. These findings show that CCTV effectiveness depends heavily on system quality, maintenance, and technological reliability (Piza et al., 2020; Yang et al., 2024; Ashby, 2021). Poor-quality footage and malfunctioning systems reduce both deterrence and evidentiary value (Welsh et al., 2020; Lim & Wilcox, 2021). System integration, uptime reliability, and image clarity are also critical to surveillance success (Kitchin, 2021; Chainey et al., 2022). Thus, when CCTV systems are technologically weak, their role as capable guardians is reduced, limiting their contribution to crime prevention, crime mapping, and emergency response.

3.1.2 Operational Gaps in Monitoring and Response

The findings indicated that CCTV systems were often used for post-incident review rather than real-time monitoring. Participants explained that monitoring was not continuous because of limited personnel, and footage was commonly reviewed only after an incident had already occurred. This reduced the preventive function of CCTV systems and limited their usefulness for immediate response. This finding confirms that CCTV systems are more effective when supported by active and real-time monitoring (Welsh et al., 2020; Ratcliffe et al., 2020). Surveillance systems with continuous monitoring and rapid response protocols are more useful in reducing crime and improving situational awareness (Piza et al., 2020; Caplan et al., 2021). When linked with analytical and response systems, real-time surveillance enhances crime prevention and resource deployment (Braga et al., 2021; Chainey et al., 2022). Without such integration, CCTV remains reactive rather than strategic.

3.1.3 Human Resource and Training Constraints

The findings revealed that personnel assigned to CCTV operations often lacked sufficient technical training. Participants noted that assigned staff were not formally trained, were not experts in using the system, and sometimes did not know how to handle certain incidents. These limitations affected monitoring accuracy, incident interpretation, and timely response. The result highlights the importance of trained personnel in maximizing the value of CCTV systems. Operator expertise improves detection accuracy, situational assessment, and response efficiency (Ashby, 2021; Chainey et al., 2022). Skilled personnel are also needed to transform CCTV data into actionable intelligence for crime prevention and emergency response (Caplan et al., 2021; Braga et al., 2021). Continuous training improves technical and analytical competence (Piza et al., 2020; Ratcliffe et al., 2020), showing that human resources are essential components of an effective surveillance system.

3.1.4 Resource and Budgetary Limitations

The findings identified limited funding as a major barrier to CCTV operations. Participants reported delayed repairs, inability to upgrade systems, insufficient cameras, lack of coverage in some areas, and shortage of manpower. These constraints affected the performance, coverage, maintenance, and sustainability of barangay CCTV systems. This finding is consistent with literature showing that funding is a critical factor in surveillance effectiveness and sustainability (Sukor, 2024; Reyes & Santos, 2022). Limited financial resources restrict system expansion, maintenance, and modernization

(Kitchin, 2021; Afzal, 2024). From a crime prevention perspective, weak or poorly maintained surveillance systems reduce the perceived risk of detection and weaken deterrence (Piza et al., 2020; Welsh et al., 2020). Resource constraints also prevent integration with crime mapping and data-driven policing strategies (Braga et al., 2021; Ratcliffe et al., 2020).

3.1.5 Governance, Coordination, and Privacy Concerns

The findings showed that governance, coordination, and privacy issues affected CCTV operations. Participants reported delays in coordination with police, slow response from authorities, resident concerns about privacy, and questions about who could access CCTV footage. These concerns reduced operational efficiency and affected public trust in the system. This finding emphasizes that surveillance systems must be supported by transparency, accountability, and clear governance structures. Public acceptance of CCTV depends on perceptions of fairness, data protection, and institutional accountability (Taylor, 2021). Surveillance technologies must also operate within clear governance frameworks to prevent misuse and maintain legitimacy (Kaufmann and Peil, 2020). Transparent data policies and stakeholder coordination strengthen both effectiveness and public trust (Kitchin, 2021; Afzal, 2024), while integrated communication with law enforcement improves the operational value of surveillance systems (Ratcliffe et al., 2020; Braga et al., 2021).

3.2 Stakeholder Experiences with CCTV Systems in Crime Prevention and Emergency Response

3.2.1 Enhanced Monitoring and Situational Awareness

The findings showed that CCTV systems improved the ability of barangay personnel to monitor activities and detect suspicious behavior. Participants described CCTV as helpful in observing streets, increasing awareness of community situations, and extending surveillance coverage even in areas where personnel were not physically present. This finding supports the view that CCTV systems improve environmental visibility, surveillance coverage, and crime detection capability (Piza et al., 2020; Lim & Wilcox, 2021). Continuous visual data also strengthens situational awareness for both immediate response and post-incident analysis (Welsh et al., 2020; Chainey et al., 2022). Real-time monitoring enhances responsiveness and operational effectiveness (Kitchin, 2021; Yang et al., 2024), and surveillance data can support hotspot identification and strategic resource deployment (Ratcliffe et al., 2020; Braga et al., 2021).

3.2.2 Perceived Increase in Safety and Security

The findings revealed that residents and officials felt safer because of CCTV presence. Participants stated that people became more secure and cautious because they knew cameras were present. CCTV systems therefore contributed not only to actual monitoring but also to the psychological perception of safety. This finding is supported by studies showing that CCTV systems can improve perceived security and reduce fear of crime in some contexts (Welsh et al., 2020; Tykesson, 2025). Surveillance technologies increase visibility and signal formal social control, which helps create a sense of order and safety (Solymosi et al., 2021; Lim & Wilcox, 2021). However, the effect on public perception may vary depending on environmental context, previous victimization, and trust in authorities (Kaufmann & Peil, 2020; Taylor, 2021). CCTV also reinforces perceived guardianship, influencing behavior through the belief that actions are being observed (Piza et al., 2020; Kitchin, 2021).

3.2.3 Support in Crime Investigation and Evidence Gathering

The findings showed that CCTV systems were useful in investigations by helping identify suspects, verify events, reconstruct incidents, and provide visual evidence. Participants emphasized that CCTV footage made it easier to determine what happened and supported case resolution. This finding confirms that CCTV footage strengthens investigations by providing objective and verifiable evidence (Piza et al., 2020; Braga et al., 2021). Surveillance footage improves suspect identification and evidence-based decision-making (Welsh et al., 2020; Ashby, 2021). It also supports witness corroboration and legal proceedings (Ratcliffe et al., 2020; Chainey et al., 2022). When combined with crime reports and spatial data, CCTV footage contributes to more systematic and data-driven investigations (Braga et al., 2021; Kitchin, 2021).

3.2.4 Improved Emergency Response Coordination

The findings indicated that CCTV systems improved emergency response by allowing faster verification of incidents and better coordination with authorities. Participants stated that CCTV helped determine the type of response needed, coordinate with the police, and manage emergency situations more efficiently. This finding shows that surveillance systems improve response efficiency by providing real-time information and situational awareness (Kaufman & Peil, 2020; Yang et al., 2024). When integrated with communication and dispatch mechanisms, CCTV supports faster incident verification and more effective deployment of law enforcement resources (Ratcliffe et al., 2020; Braga et al., 2021). Real-time visual data also improves emergency management by supporting rapid assessment and coordinated response (Kitchin, 2021; Chainey et al., 2022). Thus, CCTV systems function best when embedded within coordinated response protocols.

3.2.5 Limitations in Maximizing System Use

The findings revealed that despite their benefits, CCTV systems were not fully maximized because of lack of personnel, system malfunction, limited coverage, and inadequate maintenance. Participants recognized that these limitations

prevented CCTV systems from being fully used for real-time prevention, analysis, and response. This finding shows that CCTV effectiveness depends not only on installation but also on management, monitoring, and integration with policing strategies (Caplan et al., 2021). Surveillance systems have greater impact when embedded in data-driven policing frameworks, including crime mapping, intelligence analysis, and coordinated response mechanisms (Piza et al., 2020; Braga et al., 2021). Poorly managed or fragmented systems have limited deterrent and operational value (Ashby, 2021; Welsh et al., 2020), while surveillance data must be actively processed to generate insights on crime patterns and hotspot areas (Ratcliffe et al., 2020; Chainey et al., 2022).

3.3 Insights on the Role and Effectiveness of CCTV Systems

3.3.1 CCTV as a Deterrent to Criminal Activities

The findings showed that participants viewed CCTV systems as deterrents to criminal behavior. They explained that visible cameras made people more cautious, discouraged offenders, and encouraged compliance with rules because individuals knew they were being observed. This finding supports literature showing that CCTV contributes to crime reduction by increasing the perceived risk of detection and apprehension (Piza et al., 2020; Welsh et al., 2020). The deterrent effect is stronger when cameras are visible and actively monitored (Lim & Wilcox, 2021; Ashby, 2021). Increasing surveillance and reducing anonymity are also effective in discouraging opportunistic crimes (Braga et al., 2021; Ratcliffe et al., 2020). From a Rational Choice Theory perspective, CCTV increases the perceived cost of committing crime, while perceived guardianship promotes compliance with social norms (Kitchin, 2021; Taylor, 2021).

3.3.2 CCTV as a Tool for Accountability and Transparency

The findings indicated that CCTV systems promoted accountability and transparency by documenting events and providing objective evidence. Participants noted that CCTV footage helped verify incidents, prevent false accusations, support investigations, and make processes more transparent. This finding is supported by literature showing that surveillance systems enhance documentation, strengthen evidentiary processes, and reduce ambiguity in incident reporting (Braga et al., 2021; Piza et al., 2020). CCTV footage helps minimize disputes by providing visual records that support legal or administrative decision-making (Welsh et al., 2020; Ashby, 2021). In digital governance, surveillance technologies also improve institutional accountability by enabling traceability and auditability of actions (Kitchin, 2021; Taylor, 2021).

3.3.3 Dependence on System Quality and Management

The findings revealed that participants believed CCTV effectiveness depended on system quality, maintenance, monitoring, and proper management. They stated that CCTV systems could not be effective if cameras were unclear, equipment was broken, no one monitored the system, or management practices were weak. This finding confirms that CCTV effectiveness depends on proper system operation, continuous maintenance, and active management (Caplan et al., 2021). Surveillance systems require technical support, monitoring protocols, and performance evaluation to remain reliable (Piza et al., 2020; Ashby, 2021). Poorly managed systems experience reduced uptime, lower performance, and weaker deterrent and investigative value (Kitchin, 2021; Yang et al., 2024). Effective management also requires standard procedures, assigned responsibilities, and integration with analytical and response mechanisms (Braga et al., 2021; Ratcliffe et al., 2020).

3.3.4 Need for Integration with Crime Mapping and Policing Strategies

The findings showed that participants considered CCTV more effective when integrated with crime analysis, hotspot identification, police coordination, and security planning. They emphasized that CCTV should not only record incidents but also support broader crime prevention strategies. This finding is consistent with studies showing that CCTV systems are most effective when embedded within Geographic Information Systems and intelligence-led policing models (Ratcliffe et al., 2020; Braga et al., 2021). Combining surveillance data with crime mapping improves resource allocation, hotspot prioritization, and evidence-based interventions (Piza et al., 2020; Chainey et al., 2022). Data integration and real-time analytics also strengthen situational awareness and predictive crime prevention (Kitchin, 2021; Yang et al., 2024). Thus, CCTV becomes more strategic when used as part of a coordinated policing system rather than as a standalone surveillance tool.

3.3.5 Importance of Community Trust and Acceptance

The findings revealed that public trust and community acceptance were essential to the success of CCTV systems. Participants explained that people needed to understand the purpose of CCTV, trust its use, and know the rules on access and privacy. Transparency was viewed as necessary for gaining community support. This finding shows that public trust is central to surveillance effectiveness. Perceptions of fairness, accountability, and data protection influence public acceptance of CCTV technologies (Taylor, 2021). Surveillance systems require social legitimacy built through transparency, ethical governance, and responsible data management, as argued by Kaufmann and Peil (2020). Community engagement and clear communication improve acceptance and long-term sustainability (Kitchin, 2021; Solymosi et al., 2021). When surveillance is perceived as protective rather than intrusive, it strengthens informal social control and compliance with social norms (Welsh et al., 2020; Lim & Wilcox, 2021).

3.4 Recommended Measures to Enhance Barangay CCTV Operations

3.4.1 Upgrading and Maintaining CCTV Infrastructure

The findings showed that participants recommended upgrading CCTV infrastructure through clearer cameras, regular maintenance, and backup systems. They emphasized that camera quality, system reliability, and uninterrupted operation were necessary to improve CCTV effectiveness. This finding supports literature emphasizing that system quality, technological reliability, and infrastructure design determine surveillance effectiveness (Piza et al., 2020; Yang et al., 2024). High-resolution imaging, stable connectivity, sufficient storage, and regular maintenance improve both real-time monitoring and post-incident analysis (Ashby, 2021; Welsh et al., 2020). Modernized systems and integrated platforms also enhance situational awareness and operational efficiency (Kitchin, 2021; Chainey et al., 2022). Stronger infrastructure also supports crime mapping and hotspot analysis (Braga et al., 2021; Ratcliffe et al., 2020).

3.4.2 Strengthening Monitoring and Operational Systems

The findings revealed that participants recommended 24/7 monitoring, clear CCTV protocols, assigned personnel, and faster response when incidents are observed. These measures were seen as necessary to shift CCTV from passive recording to active crime prevention and emergency response. This finding confirms that active and continuous monitoring improves the preventive capability of CCTV systems (Welsh et al., 2020; Ratcliffe et al., 2020). Surveillance systems with structured protocols, incident reporting procedures, and rapid response mechanisms are more effective in reducing crime and improving situational awareness (Piza et al., 2020; Caplan et al., 2021). Systems without organized monitoring have limited deterrent and operational impact (Ashby, 2021). Effective surveillance therefore requires alignment of monitoring, communication, and response processes (Braga et al., 2021; Chainey et al., 2022).

3.4.3 Capacity Building and Training of Personnel

The findings showed that participants recommended continuous training and seminars for CCTV personnel. They emphasized that operator skills, technical knowledge, and specialized monitoring training were important in making the system more effective. This finding reinforces the importance of human resource development in CCTV operations. Trained personnel improve surveillance efficiency, detection accuracy, and response effectiveness (Ashby, 2021; Chainey et al., 2022). Operator expertise helps convert surveillance data into actionable intelligence, particularly in identifying suspicious behavior and coordinating response (Caplan et al., 2021; Braga et al., 2021). Continuous training also develops technical and analytical competencies needed for effective system utilization (Piza et al., 2020; Ratcliffe et al., 2020).

3.4.4 Increasing Budget Allocation and Resource Support

The findings revealed that participants strongly recommended increased budget allocation for maintenance, upgrades, additional cameras, staffing, and monitoring resources. They emphasized that CCTV systems could not remain effective if funding was insufficient. This finding is consistent with studies identifying funding as a key determinant of CCTV effectiveness and sustainability (Sukor, 2024; Reyes & Santos, 2022). Continuous financial support is needed for maintenance, upgrades, network integration, and real-time monitoring systems (Kitchin, 2021; Afzal, 2024). Underfunded systems are more likely to experience performance decline and reduced crime prevention impact (Piza et al., 2020; Welsh et al., 2020). Adequate investment also supports training, monitoring centers, data management platforms, and intelligence-led policing (Braga et al., 2021; Ratcliffe et al., 2020). Strong and visible surveillance systems further increase perceived detection risk, strengthening deterrence (Piza et al., 2020; Lim & Wilcox, 2021).

3.4.5 Enhancing Governance, Coordination, and Community Engagement

The findings showed that participants recommended stronger police coordination, clearer rules on access to CCTV footage, explanation of CCTV purposes to the community, and greater transparency. These measures were viewed as necessary for improving trust, accountability, and acceptability. This finding confirms that trust, accountability, and transparency are essential to surveillance acceptance (Taylor, 2021; Kaufmann & Peil, 2020). Public engagement and participatory governance strengthen legitimacy and community support for surveillance initiatives (Kitchin, 2021; Solymosi et al., 2021). Clear policies, ethical data management, and stakeholder communication also improve institutional credibility and system effectiveness (Afzal, 2024; Welsh et al., 2020). Strong inter-agency collaboration and structured communication channels are necessary for timely and coordinated response (Ratcliffe et al., 2020; Braga et al., 2021). Overall, effective CCTV implementation requires a holistic approach that combines technological capability, trained personnel, coordinated governance, and community trust.

4. Conclusion & Recommendations

Based on the findings, barangay CCTV operations contribute to crime prevention, emergency response, monitoring, investigation, accountability, and perceived community safety; however, their effectiveness is weakened by technological limitations, unreliable system performance, lack of continuous monitoring, insufficiently trained personnel, limited funding, delayed coordination with law enforcement agencies, and concerns regarding data access and privacy. The study concludes that CCTV systems are most effective when supported by reliable infrastructure, active monitoring, competent personnel, adequate resources, clear operational protocols, transparent governance, community trust, and integration with

crime mapping and policing strategies.

Barangay officials and local government units should prioritize the upgrading and maintenance of CCTV infrastructure through high-resolution cameras, improved storage systems, reliable connectivity, backup systems, and regular preventive maintenance. They should also establish 24/7 monitoring systems, assign dedicated personnel, implement continuous training and capacity-building programs for CCTV operators and barangay personnel, strengthen coordination with law enforcement agencies through formal agreements and communication protocols, provide sufficient budget allocation for system improvement and staffing, and promote transparency by informing the community about CCTV operations to build public trust and acceptance.

The study was limited to selected barangays in Mandaluyong City; therefore, its findings may not be generalized to other cities, municipalities, or regions with different socio-economic, technological, and governance conditions. It focused mainly on qualitative data drawn from the experiences, perceptions, and insights of barangay officials, CCTV operators, and community members, rather than on quantitative indicators. The study also excluded statistical crime data, numerical crime reduction analysis, response-time measurement, and large-scale national or international comparisons, as its emphasis was on the contextual and experiential aspects of barangay CCTV operations.

Compliance with ethical standards

The study was conducted in accordance with institutional ethical standards, ensuring voluntary participation, informed consent, confidentiality of information, and respect for the rights of all respondents. Ethical approval was secured when applicable, and the authors declare no conflict of interest. All contributions were properly acknowledged, and copyright ownership and authorship responsibilities were observed throughout the conduct and completion of the research.

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