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CHALLENGES FOR AUTONOMOUS MOBILITY IN POLICING
Research from Dubai Police

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ABSTRACT

Autonomous vehicles are reshaping mobility with implications for policing, yet limited attention has been given to organizational readiness. This study examines Dubai Police's readiness to integrate autonomous police vehicles (APVs). Using a survey of police personnel and a literature review, it assesses awareness, acceptance, perceived benefits, and concerns. Findings show that adoption depends not only on technological capability but on the alignment of organizational awareness, governance frameworks, and institutional capacity. The study contributes to emerging research on autonomous mobility by emphasizing the role of organizational and institutional factors in enabling the responsible deployment of autonomous systems in public safety contexts.

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1. Introduction: Why this research?

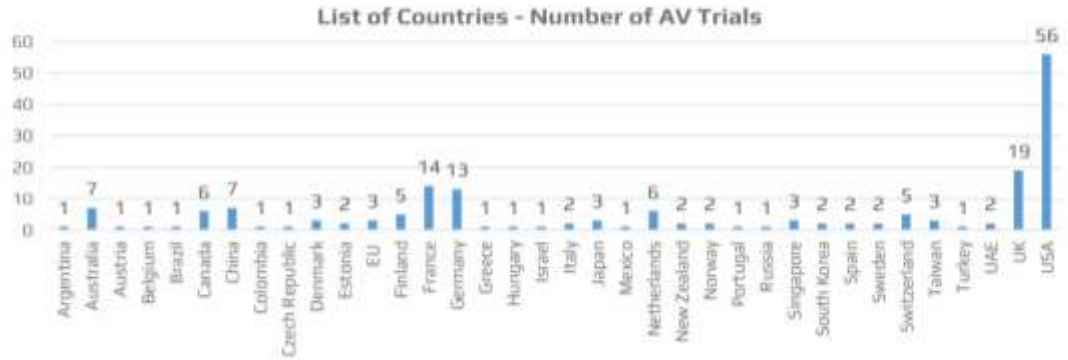
1.1. Overview

Autonomous vehicles (AVs) have seen an increase in recent years, largely due to progress in automation across various sectors (Mishra et al., 2023; Muralidhar et al., 2023). Specifically, the automotive industry has been actively integrating crucial algorithms and technologies into standard vehicles, focusing on six key performance categories: steering, acceleration, deceleration, monitoring the driving environment, fallback strategies for issues that arise during dynamic driving tasks, and the driving modes the system can support (Duarte & Ratti, 2018). These vehicles employ a blend of sensors, cameras, machine learning algorithms, and artificial intelligence algorithms to navigate effectively, avoid obstacles, and make decisions in real-time (Muralidhar et al., 2023).

The adoption of autonomous vehicles is predicted to differ significantly between geographical areas and technological scenarios. While some projections anticipate that autonomous vehicles may account for a substantial share of new vehicle sales in the coming decades, other analyses suggest a more gradual transition in which widespread fleet penetration may not occur until the mid-twenty-first century (Alatawneh & Torok, 2023; Zhang et al., 2025). Despite this uncertainty, substantial investment in autonomous mobility continues worldwide. Automotive manufacturers, technology firms, and governments are investing billions of dollars in research, development, and pilot programs aimed at evaluating the technical feasibility, safety implications, and regulatory requirements associated with autonomous mobility (Canitez, 2021) .

Figure 1 illustrates the distribution of autonomous vehicle trials across different countries. Nations such as the Netherlands, Singapore, Norway, the United States, Sweden, and the United Kingdom consistently rank among the most prepared for autonomous mobility according to the KPMG Autonomous Vehicles Readiness Index (Kurniawan et al., 2021), which evaluates countries based on policy frameworks, technological innovation, infrastructure readiness, and consumer acceptance (Gaitanidou & Bekiaris, 2022). Moreover, a detailed 9-country feasibility study finds Singapore, Germany, Japan, and the USA as the most prepared countries (Theoto & Kaminski, 2019). These developments reflect a broader international trend toward integrating autonomous mobility into daily operations.

Figure 1. List of Countries and the Number of Autonomous Vehicle Trials Conducted (data up to July 2021)



Source: Canitez, 2021.

In parallel with these technological developments, policing agencies worldwide are exploring how AVs may support patrol operations, enhance officer safety, improve response times, and reduce exposure to hazardous environments (Almaskati et al., 2025; Beg et al., 2021). However, despite increasing interest in the operational applications of autonomous technologies, relatively limited research has examined the organizational readiness required for their adoption within law enforcement institutions. This gap is particularly

evident in rapidly modernizing policing agencies that are actively pursuing technological innovation.

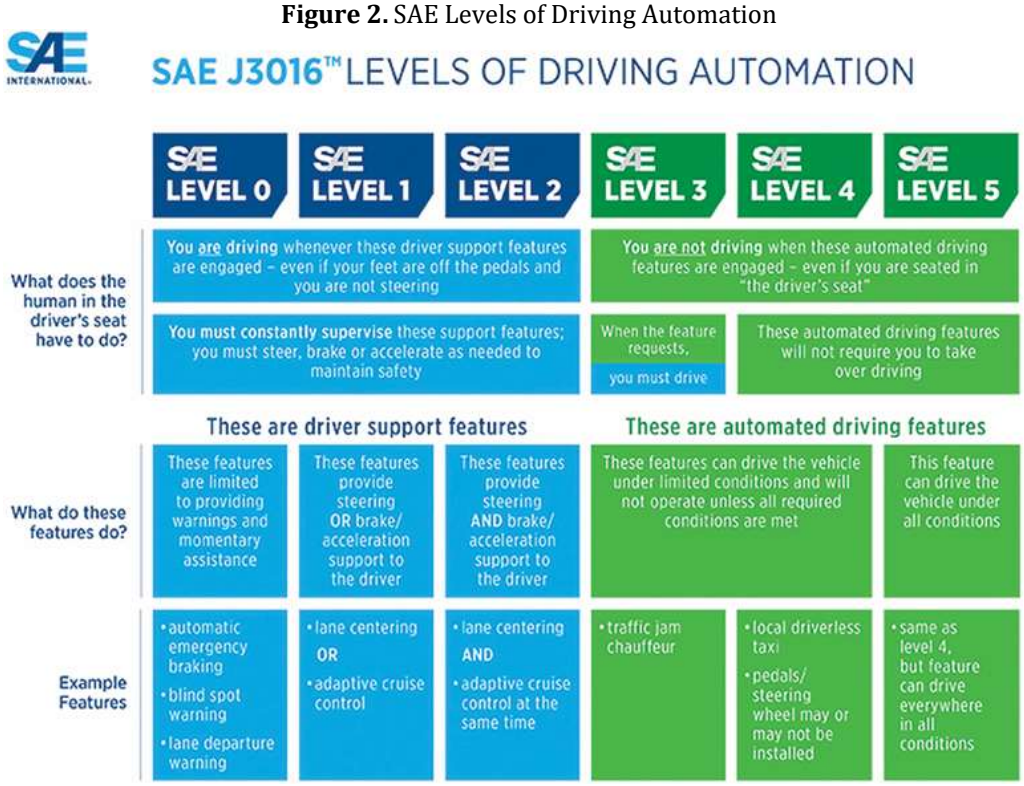
This study examines organizational readiness for the integration of autonomous police vehicles within Dubai Police, focusing on institutional awareness, acceptance, and perceived operational implications among police personnel. By combining empirical survey data with a review of international developments in autonomous technologies, the study provides insight into how law enforcement organizations may prepare for the transition toward autonomous mobility systems. In doing so, the paper contributes to the emerging literature on technology-driven policing by offering one of the first empirical assessments of organizational preparedness for autonomous policing within a large metropolitan police agency.

2. Autonomous Policing Vehicles Status

2.1. Autonomous Technology and Levels of Vehicle Automation

A variety of advanced driver assistance systems (ADAS) are incorporated into many modern vehicles to assist with driving and maneuvering. This integration of technology enhances the vehicles' level of driving autonomy, highlighting the need to classify different levels of automation (Sousa et al., 2018). Researchers, along with the National Highway Traffic Safety Administration (NHTSA) and Society of Automotive Engineers (SAE) International, have established widely adopted frameworks that categorize vehicle automation based on the capabilities of automated systems and the role of the human driver (Bathla et al., 2022; Goodison et al., 2020; Sousa et al., 2018). Figure 2 shows the six levels of vehicle automation, ranging from 0 to 5 (Bathla et al., 2022; Cascetta et al., 2022).

Figure 2. SAE Levels of Driving Automation



Source: Goodison et al., 2020.

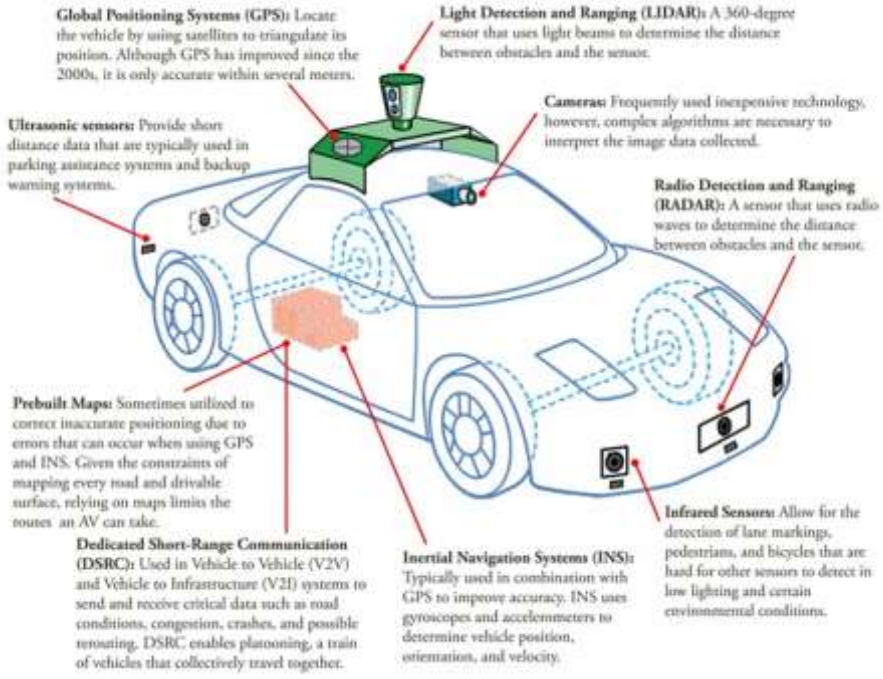
- **Level 0:** There is no automation involved; the driver is responsible for all driving tasks.
- **Level 1**: The human driver oversees controlling the vehicle, but the automation system provides helpful assistance.
- **Level 2:** The vehicle can have some automated functions, but it still requires the driver to take control of the driving environment.
- **Level 3:** The driver should be ready to take control of the vehicle whenever necessary.
- **Level 4:** In certain situations, the automation system can drive the car on its own, but the human driver can still take control.
- **Level 5:** The automation system can handle all driving tasks under any conditions without human help (Alessandrini et al., 2021; Bathla et al., 2022; Gerber et al., 2023).

AVs function using a three-phase model called "sense-plan-act," which is often seen in robotics. In this framework, sensor systems collect information about the surrounding environment, computational algorithms analyze this information to determine appropriate actions, and vehicle control systems execute the selected driving maneuvers (Badue et al., 2021). AVs utilize various sensor technologies, as shown in Figure 3. These include Lidar (Light Detection and Ranging), Radar (Radio Detection and Ranging), Global Positioning Systems (GPS), cameras, optical sensors, and onboard computers (Azam et al., 2020). These sensing technologies work together to provide the vehicle with situational awareness, enabling real-time decision-making such as adjusting speed, maintaining lane position, and avoiding obstacles(Amgothu et al., 2025). Understanding the technological architecture and levels of automation is particularly important when considering the potential deployment of autonomous vehicles in policing contexts. Unlike conventional civilian mobility systems, autonomous police vehicles may be required to support mission-specific tasks such as patrol operations, emergency response, surveillance activities, and operations in potentially hazardous environments.

These operational requirements may necessitate specialized sensing capabilities, enhanced situational awareness systems, and integration with law enforcement communication and command networks. Consequently, manufacturers and technology developers may need to account for policing operational requirements when designing autonomous platforms.

Aligning vehicle capabilities with policing missions is therefore an important consideration for agencies exploring the future integration of autonomous mobility technologies.

Figure 3. Autonomous Vehicle Sensor Technologies



Source: Goodison et al., 2020.

2.2. Evolution of Technology Adoption in Policing

The adoption of advanced technologies within policing has historically followed a gradual and institutionalized trajectory, shaped by operational necessity, public accountability, and regulatory oversight. From the early integration of radio communications and patrol vehicles to more recent deployments of body-worn cameras, automated license plate readers, and unmanned aerial systems, law enforcement agencies have consistently leveraged technological innovation to enhance situational awareness, officer safety, and service efficiency (Bag et al., 2024; Teti, 2023).

Within this context, the rapid advancement of AV technology represents a natural extension of existing trends in technology-enabled policing. As early as 2014, the National Institute of Justice, in collaboration with the RAND Corporation, identified autonomous road vehicles as a high-priority emerging technology for law enforcement, reflecting growing recognition of their potential operational value (Hollywood et al., 2015). This institutional attention highlights a broader shift within policing toward autonomous mobility and decision-making.

Since then, law enforcement agencies in several countries have begun experimenting with APVs as mobile platforms capable of supporting patrol, monitoring, and public safety functions (Cowper & Levin, 2018). For example, pilot initiatives have been conducted in cities such as Beijing, alongside manufacturer-led developments and patent filings (Owano, 2018; Woods, 2019), which illustrate growing international interest in operationalizing autonomy within policing contexts.

Dubai Police has emerged as a prominent example, introducing unmanned ground patrol vehicles as early as 2017 as part of a broader smart policing and innovation agenda, demonstrating an increasing institutional readiness, growing policy engagement, and a clear trajectory toward more autonomous forms of police mobility.

Beyond field deployments, policing institutions and industry actors have also explored APVs through regulatory and policy. At the policy level, organizations such as the Police

Executive Research Forum (PERF) and RAND have facilitated structured dialogues between police leaders, researchers, and technology developers to identify operational requirements, risks, and governance challenges associated with autonomous policing technologies (Goodison et al., 2020).

Taken together, these international experiences and the policy initiatives illustrate a broader evolution in policing: from traditional vehicle-based patrol toward digitally augmented, semi-autonomous operational models. This evolving landscape provides important context for examining Dubai Police's current initiatives and the empirical evidence supporting its transition toward autonomous policing capabilities.

2.3. Dubai Police and Innovation-Driven Policing

Dubai Police, established in 1956, has evolved into one of the largest and most technologically progressive law-enforcement organizations in the region, employing approximately 30,000 personnel and operating a fleet of more than 1,000 vehicles . Within this operational scale, mobility is not merely a logistical function but a central component of policing effectiveness, emergency response, and public-safety delivery.

In recent years, Dubai Police has pursued a structured transformation toward digitally enabled and automation-ready mobility systems, reflecting broader institutional efforts to integrate emerging technologies into policing operations. A key institutional milestone in this transition was the establishment of the Future of Digital Mobility Center in 2023**,** created to explore how emerging technologies, such as artificial intelligence, Internet of Things systems, and predictive analytics, can be applied to police mobility and transport operations. The Center operates as a governance and innovation hub rather than a single-project unit for police mobility, supporting foresight research, engineering development, and digital fleet management initiatives. Through this structure, mobility innovation is embedded within an institutional framework that supports experimentation while maintaining policy oversight and performance accountability.

Dubai Police's modernization has progressed through several smart mobility initiatives that collectively establish the technological and operational foundations for future autonomous mobility. One example is the Ghiath Smart Patrol Vehicle (Kimura, 2023), which represents a transition from conventional patrol vehicles toward intelligent, sensor-enabled platforms that integrate AI-based analytics, real-time data systems, and multi-sensor surveillance capabilities to enhance situational awareness and operational efficiency. Although the vehicle is not fully autonomous, it illustrates an incremental pathway toward higher levels of automation in police mobility.

Complementing these developments, the IServe initiative introduced a digitally managed electric vehicle car-sharing system that incorporates telematics, predictive maintenance, and centralized booking and analytics, reflecting a broader transition toward data-driven fleet governance and sustainable mobility management (Ali, 2023, p. 12).

Dubai Police has also advanced remote and unmanned mobility capabilities through the Drone Box project (Elsalhy et al., 2024), which deploys fully autonomous drones for patrol support, incident response, and monitoring, providing operational experience in supervising autonomous systems and integrating aerial platforms into policing workflows. Earlier pilot efforts, including unmanned ground vehicles, further demonstrate a cautious and exploratory approach to autonomous mobility under controlled conditions, enabling institutional learning without large-scale operational disruption. Across these initiatives, Dubai Police has integrated fleet intelligence systems such as telematics, AI-supported routing and dispatch, and predictive maintenance analytics, shifting fleet management from reactive oversight to proactive, data-driven optimization, which is considered an essential prerequisite for supervising semi-autonomous and fully autonomous platforms in the future.

These technological advancements are supported by internal policy development and participation in emirate-level regulatory coordination, ensuring that innovation proceeds

within governance frameworks addressing safety, data security, and accountability. Within this context, the adoption of autonomous police vehicles is currently under formal study and strategic consideration rather than immediate deployment, reflecting recognition that autonomy in policing depends not only on technical capability but also on workforce preparedness and institutional readiness.

To better understand this organizational dimension, Dubai Police conducted an internal survey examining personnel awareness, acceptance, and perceived readiness regarding the integration of autonomous police vehicles. In parallel, a review of international literature was undertaken to identify potential operational and governance challenges associated with autonomous policing technologies. Together, the empirical survey findings and literature-based risk assessment provide a structured foundation for evaluating both the opportunities and the potential constraints associated with the future adoption of autonomous policing mobility systems.

3. Research, Scope, and Methodology

To evaluate internal readiness for integrating APVs, an organizational survey was conducted by the General Department of Transport and Rescue in 2025. The aim was to measure officers' awareness, acceptance, and perceived implications of autonomous vehicle technology in policing.

3.1. Methodology

The survey was distributed electronically to Dubai Police personnel through SMS invitations, targeting employees across both operational and administrative departments. The survey remained open for responses between 3 September and 13 October 2025. A total of 1,142 responses were received from the Dubai Police workforce, corresponding to an approximate response rate of 5.5%. Although the response rate was relatively significant, the large number of responses and the representation of personnel across multiple ranks, departments, and experience levels provided a meaningful and diverse overview of organizational perceptions. Based on standard sampling calculations, this sample size corresponds approximately to a 95% confidence level with a margin of error of about ±5%, allowing for a reasonably representative assessment of organizational attitudes toward autonomous policing technologies.

Respondents represented a diverse cross-section of the organization in terms of job roles, years of service, educational background, and nationality. This diversity enabled the survey to capture perspectives from both frontline operational personnel and supervisory staff involved in managerial and strategic decision-making.

The questionnaire consisted of a combination of categorical, multiple-choice, and scaled items designed to capture varying levels of awareness, perceptions, and attitudes toward autonomous police vehicles. Awareness of autonomous vehicle technology was measured using a three-level scale ranging from "no knowledge" to "good knowledge." Prior to distribution, the questionnaire was reviewed and validated by the Dubai Police Survey Center to ensure clarity, relevance, and alignment with operational policing contexts.

Participation in the survey was voluntary, and responses were collected anonymously in accordance with Dubai Police data protection and confidentiality policies to ensure respondent privacy.

4. Results & Findings

4.1. Awareness and Familiarity with Autonomous Vehicles

The survey results indicate a moderate level of organizational awareness regarding autonomous vehicle technologies within Dubai Police. Overall, 63.6% of respondents reported a basic to strong level of familiarity with autonomous vehicle technologies. As illustrated in Figure 4, awareness levels varied across organizational roles. Supervisory

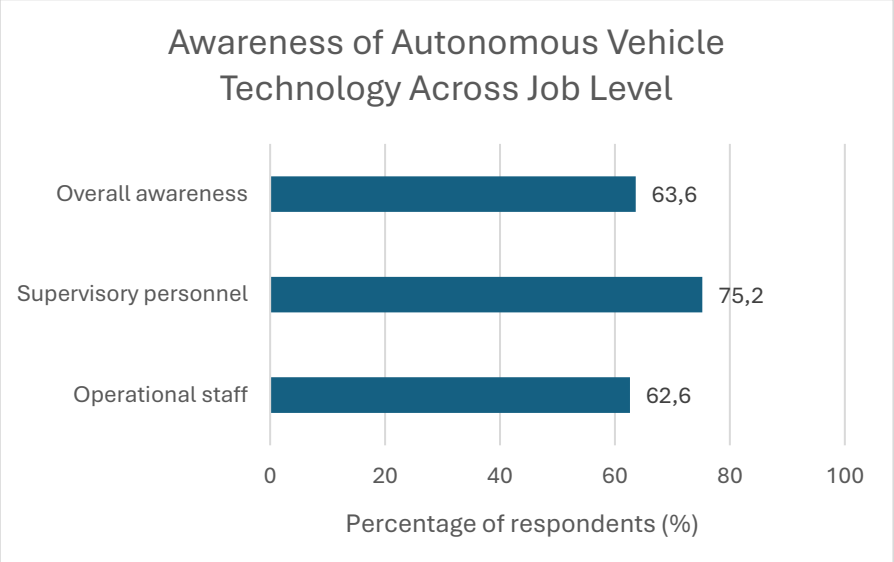
personnel demonstrated a notably higher level of awareness, averaging 75.2%, compared with 62.6% among operational-level staff.

This difference can be partly explained by variations in exposure to strategic and technological initiatives within the organization. Supervisory roles, such as general managers, department heads, and deputy sub-department managers, are more frequently involved in strategic planning processes, innovation programs, and policy discussions related to emerging technologies. Such exposure likely contributes to a higher level of familiarity with future-oriented technologies such as autonomous police vehicles.

In contrast, operational personnel, who constitute the majority of frontline policing roles, reported comparatively lower awareness levels despite being the group most likely to interact directly with autonomous systems during field deployment. This discrepancy highlights a potential implementation challenge: while leadership may demonstrate conceptual readiness for adopting autonomous policing technologies, operational familiarity with such systems may still require further development.

The observed awareness levels indicate that familiarity with autonomous vehicle technologies is emerging within the organization but has not yet reached full institutional diffusion. In large policing organizations where, operational responsibilities vary across units and ranks, awareness of new technologies often develops unevenly as personnel gain exposure through strategic initiatives, operational trials, and internal communication. As a result, targeted awareness initiatives and structured training programs will be important to ensure that both leadership and frontline personnel develop a sufficient understanding of autonomous systems before their potential large-scale deployment within policing operations.

Figure 4. Awareness of Autonomous Vehicle Technology among Dubai Police Personnel



Source: Own elaboration, 2026.

4.2. Acceptance Toward the Use of APVs in Policing

Beyond awareness, the survey also examined personnel perceptions regarding the potential operational value of APVs within policing activities. Overall, the findings indicate a generally positive but cautious level of acceptance toward the integration of autonomous mobility technologies.

As shown in Table 1, a substantial majority of respondents (74.7%) indicated that APVs could help them perform policing tasks more efficiently, suggesting that officers recognize the potential of automation to enhance operational coverage and reduce manual workload in routine policing activities.

Similarly, 65.5% of respondents believed that autonomous police vehicles could enhance safety during field operations, indicating that many personnel perceive autonomous platforms as tools that could reduce officer exposure to hazardous environments. Such perceptions are particularly relevant in policing contexts where personnel frequently operate in unpredictable or high-risk situations. At the same time, the findings reveal a degree of uncertainty regarding workforce implications. Approximately 52.6% of respondents expressed concern about potential job displacement, reflecting a common organizational response to emerging technologies in which anticipated efficiency gains coexist with concerns about long-term role transformation. However, within Dubai Police, technological transformation initiatives are generally accompanied by workforce development strategies that emphasize reskilling, upskilling, and role reassignment. Consequently, the introduction of autonomous technologies is more likely to reshape job functions and competency requirements than reduce workforce demand, supporting a transition toward new technology-enabled policing roles.

In addition to role-based perceptions, respondents were asked to identify the policing domains in which APVs could provide the greatest operational value. As presented in Table 2, the highest level of support (68.3%) was associated with criminal operations and surveillance-related tasks, including monitoring high-risk locations, identifying wanted individuals, and conducting perimeter patrols. Comparable levels of support were also observed for specialized operational deployments such as major event security or tactical support (65.5%) and community patrol activities (60.6%). These findings suggest that officers primarily view autonomous police vehicles as operational support tools capable of expanding patrol coverage and improving monitoring capabilities rather than replacing core policing functions that require human judgment.

Table 1. Perceived Impact of Autonomous Police Vehicles on Officer Roles

Perceived Impact	Percentage of Respondents
Improving task efficiency	74.7%
Enhancing officer safety	65.5%
Concern about job displacement	52.6%

Source: Own elaboration, 2026.

Table 2. Perceived Operational Areas where APVs provide the Greatest Value

Operational Area	Percentage of Respondents
Criminal surveillance operations	68.3%
Specialized operational deployments	65.5%
Community patrol roles	60.6%

Source: Own elaboration, 2026.

Taken together, the results suggest that acceptance of autonomous police vehicles among Dubai Police personnel is primarily driven by perceived operational benefits rather than technological novelty alone. This pattern aligns with the Technology Acceptance Model (TAM), which proposes that technology adoption within organizations is strongly influenced by perceived usefulness and expected performance improvements (Bazine, 2025). In this context, the relatively high levels of perceived efficiency and safety benefits appear to play a key role in shaping positive attitudes toward autonomous policing technologies.

The clustering of responses within the 60–70% range suggests a moderate but positive level of institutional acceptance toward autonomous police vehicles. In policing organizations where safety, accountability, and operational reliability are critical considerations, acceptance of emerging technologies typically evolves gradually as personnel observe their practical benefits through pilot deployments and operational experience. The findings therefore indicate that while most respondents recognize the potential value of autonomous policing technologies, continued experimentation,

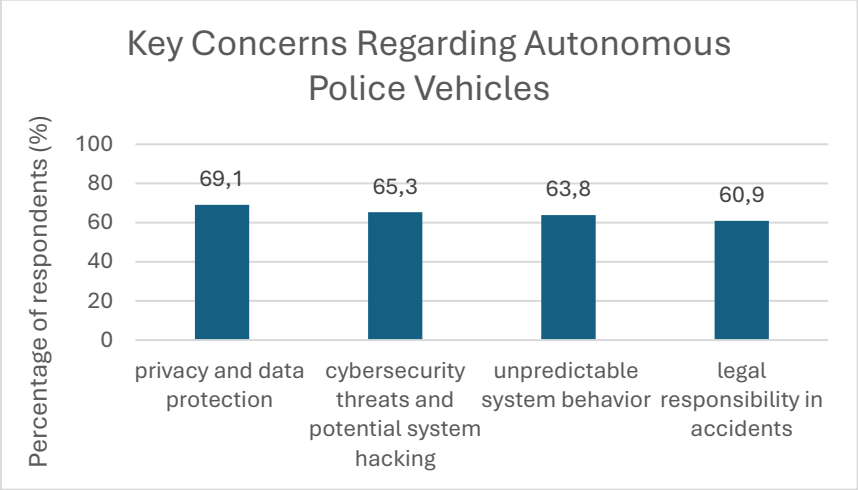
operational trials, and institutional communication will be necessary to strengthen organizational confidence prior to large-scale implementation.

4.3. Governance Concerns and Capacity Requirements for Autonomous Police Vehicles

While respondents generally acknowledged the potential operational benefits of APVs, the survey findings also revealed several governance-related concerns and institutional capacity requirements that may influence their future implementation within policing environments. As illustrated in Figure 5, the most frequently cited concerns were related to privacy and data protection (69.1%), cybersecurity threats and potential system hacking (65.3%), and the possibility of unpredictable system behavior during emergency situations (63.8%). In addition, 60.9% of respondents expressed concerns regarding legal responsibility in the event of accidents or system failures, highlighting the importance of clearly defined accountability frameworks for autonomous systems operating in public safety contexts.

These concerns reflect the distinctive governance challenges associated with integrating autonomous technologies into policing operations. Unlike many other sectors, law enforcement agencies must ensure that technological systems operate within strict legal, ethical, and accountability frameworks while maintaining high levels of operational reliability and public trust. The relatively high level of concern regarding privacy, cybersecurity, and legal responsibility therefore suggests that officers are not only considering the operational advantages of autonomous vehicles but are also aware of the institutional and regulatory implications associated with their deployment.

Figure 5. Key Concerns regarding Autonomous Police Vehicle Adoption among Respondents



Source: Own elaboration, 2026.

In parallel with these governance concerns, respondents identified several training priorities that would be necessary to support the safe and effective integration of autonomous police vehicles. The most frequently identified training needs included technical training on system operation (64.7%), cybersecurity awareness and secure data handling (64.5%), legal and ethical responsibilities when supervising autonomous systems (63.7%), and emergency override and recovery procedures (63.1%). These responses indicate that personnel recognize the need for new competencies related to supervising automated systems, managing potential technological failures, and ensuring compliance with legal and ethical standards.

Taken together, these findings highlight that the adoption of autonomous police vehicles depends not only on technological capability but also on institutional preparedness. The introduction of autonomous systems requires well-defined governance frameworks, clear legal responsibilities, and comprehensive training programs.

5. Discussion: Implications for Autonomous Vehicles Adoption in Modern Policing

The survey findings indicate that the potential integration of APVs should be understood as an organizational transformation rather than solely a technological upgrade. As illustrated in the conceptual framework presented in Figure 6, organizational readiness for autonomous police mobility emerges from the interaction of several key factors: personnel awareness of autonomous technologies, perceived operational benefits (acceptance), governance and legal considerations, and the development of institutional capacity through training and operational experience. While Dubai Police has already invested in digital mobility platforms, smart patrol vehicles, and autonomous aerial systems, the survey results suggest that successful APV integration will depend on how these technological capabilities are supported by organizational preparedness, governance frameworks, and workforce readiness. The proposed framework reflects a micro-level organizational perspective on autonomous mobility readiness, complementing broader ecosystem models by focusing on institutional preparedness within policing contexts.

Figure 6. Conceptual Framework of Organizational Readiness for Autonomous Police Vehicles

Source: Own elaboration, 2026.

5.1. Uneven Organizational Awareness of Autonomous Technologies

The survey results reveal that although most respondents demonstrate basic familiarity with autonomous vehicle technologies, awareness remains uneven across organizational levels. Supervisory personnel tend to exhibit greater familiarity due to their involvement in strategic planning and innovation initiatives. In contrast, operational personnel, who will ultimately interact most directly with autonomous systems, report comparatively lower levels of awareness. This uneven distribution of knowledge highlights the importance of organizational knowledge diffusion as a prerequisite for technology adoption. This pattern is consistent with the diffusion of innovation framework proposed by Everett Rogers, which suggests that new technologies are typically adopted gradually within organizations, with early awareness concentrated among decision-makers before diffusing to broader user groups over time (Guo & Huang, 2024; Yu, 2022). In this context, the observed awareness gap reflects a transitional stage in which knowledge of autonomous technologies has not yet fully permeated operational levels. From a practical perspective, and consistent with established change management frameworks such as ADKAR and Kotter's model, which emphasize the critical importance of early-stage awareness and communication (Havlovska et al., 2023), this implies that targeted awareness initiatives, such as internal workshops, operational demonstrations, and structured communication programs, may be necessary to ensure that personnel across all units develop a shared understanding of the capabilities and limitations of autonomous mobility technologies. Such initiatives can reduce uncertainty and support informed engagement among frontline officers responsible for system interaction. Evidence from policing technology adoption, indicates that structured training and awareness programs significantly improve officer understanding and effective use of new systems (Halford et al., 2025).

5.2. Operational Value of Autonomous Police Vehicles in Targeted Use Cases

The findings indicate that police personnel recognize the value of autonomous systems primarily in specific operational contexts, rather than as replacements for traditional policing functions. Respondents identified surveillance, perimeter monitoring, and support for high-risk operations as the most relevant use cases for APVs, suggesting that acceptance is closely linked to perceived operational usefulness.

This pattern aligns with the Technology Acceptance Model (TAM), which posits that perceived usefulness is a primary driver of technology adoption (Bazine, 2025). Studies showed that in policing environments, technologies that demonstrably improve efficiency, safety, or situational awareness are more likely to be accepted by operational personnel (Apostolakis et al., 2022; Aviram et al., 2024). Similarly, the results of this study suggest that autonomous systems can enhance existing policing functions.

From an implementation perspective, these findings support the use of phased deployment strategies, in which autonomous systems are introduced in clearly defined

operational scenarios. Studies suggest that hands-on demonstrations and operator engagement are critical for building user confidence through pilot deployments and controlled trials as mechanisms for evaluating system performance (Chancey et al., 2025; Murtaza et al., 2023). Such approaches allow organizations to align technological capabilities with operational requirements while minimizing risks associated with large-scale implementation. Moreover, International experience shows that phased scoping allows technical reliability, legal clarity, and institutional confidence to mature in parallel (Grimm et al., 2020; Müür & Karo, 2025).

5.3. Governance and Accountability as Critical Preconditions for Deployment

The survey results highlight governance-related concerns, particularly regarding privacy protection, cybersecurity vulnerabilities, and legal responsibility, as key determinants of organizational readiness. These concerns reflect the complex regulatory and ethical environment within which policing institutions operate, where technological failures or data misuse may have significant public safety implications.

The importance of governance frameworks in enabling autonomous mobility is widely recognized in global policy discussions (Sever & Contissa, 2024). International comparisons reveal that while some regions have advanced pilot programs and enacted specific legislation addressing AVs, harmonized legal and regulatory frameworks remain incomplete, particularly in areas such as liability allocation, data governance, and safety certification (Tran & Le, 2022).

For policing applications, these gaps are magnified due to the sensitive nature of surveillance data and the potential consequences of system failure in emergency contexts. Therefore, the deployment of APVs will require clearly defined accountability structures, including mechanisms for system supervision, incident investigation, and decision traceability. Establishing such frameworks will be essential for ensuring that autonomous systems operate in accordance with legal, ethical, and public accountability standards while maintaining institutional legitimacy and public trust. This need for regulatory clarity is reflected in broader international experience, where existing legal and insurance frameworks are insufficient for addressing the complexities of autonomous vehicle technologies, particularly with respect to liability allocation and accountability (Punev, 2020).

5.4. Workforce Skills and Institutional Capacity for Autonomous Systems

The findings highlight that workforce readiness is not merely a supporting factor but a core determinant of organizational readiness for APVs. The integration of such systems will require personnel capable of supervising automated systems, responding effectively to unexpected failures, and ensuring compliance with operational protocols. This represents a shift from traditional modes of direct operational control toward human–machine supervision, in which officers assume oversight roles over semi-autonomous and autonomous systems (Sheridan, 2021).

From a broader perspective, this transition reflects a well-established challenge in the adoption of AI-enabled and automated technologies, where effective use depends not only on technical functionality but also on user understanding, trust, and interaction capabilities. Research on autonomous vehicle adoption indicates that factors such as trust, compatibility with user expectations, and effort expectancy significantly influence individuals' willingness to engage with automated systems, highlighting the importance of ensuring that personnel feel both confident and capable when interacting with such technologies (Chaveesuk et al., 2023; Foroughi et al., 2023).

Empirical evidence further suggests that training plays a critical role in developing these competencies. Studies on automated driving have shown that simulator- and video-based training can enhance the procedural and cognitive skills required for interacting with autonomous systems, leading to improved decision-making and more calibrated levels of

trust in automation (Harari et al., 2019; Murtaza et al., 2024). These findings indicate that training is a foundational enabler of safe and effective system supervision, particularly during early stages of deployment.

In the context of policing, these insights suggest that training strategies should extend beyond conventional technical instruction to incorporate experiential and scenario-based learning approaches. Such approaches may include simulation exercises, controlled field trials, and real-time system interaction in low-risk environments, enabling officers to develop familiarity with system behavior and limitations. Moreover, training frameworks should be structured across organizational levels, combining governance and oversight competencies for supervisory personnel with practical operational skills for frontline officers.

Developing this form of institutional capacity will be essential for ensuring that autonomous police vehicles are integrated into policing operations in a manner that maintains safety, accountability, and operational effectiveness.

5.5. Autonomous Policing within the Broader Mobility Ecosystem

Finally, the findings indicate that the adoption of autonomous police vehicles should be understood within the broader context of the autonomous mobility ecosystem rather than as an isolated law enforcement initiative. Global experience shows that scaling autonomy requires coordination among vehicle manufacturers, software providers, regulators, insurers, infrastructure authorities, and institutional components (Toghi et al., 2022). Frameworks developed by the (World Economic Forum, 2025) emphasize that ecosystem readiness involves not only infrastructure and technology but also governance capacity, stakeholder coordination, and institutional preparedness. The readiness factors identified in this study are awareness, acceptance, governance, and capacity, which correspond closely to these broader ecosystem dimensions.

5.6. Potential Challenges for APV Adoption

While the survey findings provide insight into internal organizational readiness, the broader literature highlights additional systemic risks and external challenges that may influence the long-term deployment of APVs. These challenges extend beyond organizational preparedness and reflect the complex technological, ethical, and societal dimensions of autonomous policing.

5.6.1. Weaponization and Cyber Attack

A central challenge in autonomous mobility lies in balancing safety and security: safety concerns focus on preventing accidental system failures, while security addresses protection against intentional attacks (Cui & Sabaliauskaite, 2017). Like any smart device exposed to the Internet, the literature confirms an exceptionally low risk that AVs could be used as vehicle-borne improvised explosive devices (VBIEDs) if a very unlikely cybersecurity breach allows remote control of them (De La Torre et al., 2020; Giannaros et al., 2023).

Moreover, autonomous vehicles rely on complex software architectures, connected sensors, and vehicle-to-everything communication systems, making them potential targets for cyber intrusion (Kim et al., 2021). Therefore, cyberattacks underscore the importance of robust security design, secure software update chains, and clear human override mechanisms. These concerns align closely with survey findings from Dubai Police, where cybersecurity and system reliability emerged as key considerations among Dubai Police personnel. This convergence suggests that cybersecurity should be treated not only as a technical requirement but as a core governance and operational priority in the deployment of APVs.

5.6.2. Privacy Issues

Autonomous policing systems are inherently data-intensive, relying on continuous sensing and real-time analytics to support operational decision-making. This capability raises important privacy and civil liberties concerns, particularly when APVs integrate technologies such as facial recognition, automated license plate readers, and Internet of Things (IoT) communication networks (Guo & Kennedy, 2023).

As a result, privacy governance becomes central to implementation, requiring clear policies on data minimization, encryption, access control, and retention. International discussions emphasize that privacy protections must evolve alongside technological capabilities to ensure that the increased visibility enabled by autonomous systems will not create tensions between operational effectiveness and public accountability(Guo & Kennedy, 2023; Ejiofor et al., 2025; Anil & Babatope, 2024).

These concerns reinforce the findings presented in Section 4.3, highlighting that privacy governance is not merely a regulatory requirement but a critical condition for maintaining public trust and institutional legitimacy in autonomous policing.

5.6.3. Public / Police Perception

The success of APV adoption depends not only on technical readiness but also on trust among officers and the public. Research indicates that acceptance of autonomous systems is influenced by perceived safety, usability, and confidence in human oversight (Rahman & Thill, 2023).

In policing contexts, concerns often relate to the potential loss of human judgment and discretion in complex enforcement situations (Zhang et al., 2025). Organizationally, resistance may emerge if personnel perceive automation as threatening professional roles or decision-making authority (Scala et al., 2023). These dynamics are reflected in the internal survey results, which showed strong recognition of operational benefits alongside concerns regarding job displacement and technology reliability. This duality suggests that successful implementation will depend on positioning APVs as tools that augment human capabilities rather than replace them.

6. Conclusions

This study examined the organizational readiness of Dubai Police for the integration of APVs, providing empirical insight into how awareness, acceptance, governance considerations, and workforce capacity collectively shape the adoption of autonomous mobility technologies in policing contexts.

The survey results indicate that while officers widely recognize the operational value of APVs, particularly in improving efficiency, enhancing safety, and supporting surveillance, organizational readiness remains uneven across different levels of the institution. Higher awareness among supervisory personnel compared to operational staff highlights the need for targeted training and structured change management.

While concerns related to cybersecurity, data privacy, system reliability, and legal responsibility emphasize that governance clarity must evolve alongside technological advancement.

Building on these findings, the study identifies six key implications for the transition toward autonomous policing mobility. First, organizational readiness should be understood as a multidimensional construct that extends beyond technology to include institutional capacity, workforce preparedness, and governance maturity. Second, the transition requires alignment within a broader institutional configuration, where innovation is integrated with organizational structures, regulatory frameworks, and operational practices. Third, the findings support the adoption of phased deployment strategies, in which autonomous systems are introduced gradually within clearly defined and controlled use cases. Fourth, consistent with established change management frameworks such as the

ADKAR model, initial steps should therefore prioritize awareness building, communication, and pilot deployments to reduce uncertainty and foster institutional confidence. Fifth, beyond initial acceptance, the observed variation in awareness across organizational levels highlights the need for structured capability-building through targeted training programs, ensuring that both leadership and frontline personnel develop the technical knowledge and operational skills required to supervise and interact with autonomous systems effectively. Finally, the likelihood of concerns related to cybersecurity, privacy, and legal accountability discussed in the survey results and further supported by the literature review in section 5.6, including other challenges like possible weaponization and the absence of human judgment in complicated operational environments highlights the necessity of strong governance frameworks that define responsibility, ensure data protection, and establish clear mechanisms for oversight and decision visibility, reinforcing that the adoption of APVs is not only a technical or organizational transition, but also a security, ethical, and societal issue.

The findings also align with broader global discussions on autonomous mobility coordinated ecosystems, including those advanced by the (World Economic Forum, 2025), which underscore the importance of coordinated development across technological, regulatory, and institutional domains. In this context, the Dubai Police case provides a valuable example of how a public safety organization can approach autonomous mobility through a structured combination of innovation, governance, and empirical assessment, which contributes to the literature by bridging the gap between technological innovation and institutional adoption in public safety environments by providing data-driven insights into the human, institutional, and governance factors influencing adoption. This study offers a foundation for future research and supports evidence-based decision-making for policing organizations navigating the transition toward autonomous mobility.

While this study focuses on Dubai Police, its findings have broader implications for law enforcement agencies globally. Much of the existing discourse on autonomous mobility has focused on technological innovation and infrastructure development, while comparatively limited attention has been given to the organizational conditions required for public safety institutions to adopt and supervise autonomous systems. By providing empirical evidence on these institutional dimensions, this study offers a transferable framework to inform law enforcement agencies globally as they navigate the transition to autonomous mobility.

Future research should examine real-world pilot outcomes, workforce adaptation over time, and comparative regulatory models across jurisdictions. Such research will be essential for understanding how institutional readiness evolves over time and how governance frameworks can effectively support safe and accountable deployment.

Ultimately, the transition toward autonomous policing mobility will depend not only on technological advancement but on the ability of institutions to adapt their structures, capabilities, and governance frameworks accordingly. This study demonstrates that organizational readiness is a critical component of that transition, shaping how autonomous systems are understood, trusted, and effectively integrated into policing operations. As such, the findings underscore that the future of autonomous policing will be defined not only by what technology can achieve, but by how effectively institutions are prepared to govern, integrate, and responsibly manage their risks.

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