The Mediating Influence of Technology Adoption on Readiness Factors and Performance Results in Forensic Laboratories in Abu Dhabi

Zainah Naser Saeed Alhattali[1*], Khalizul Bin Khalid [1]

Faculty of Management and Economics, Sultan Idris Education University, Malaysia

[*]Corresponding Author

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ABSTRACT

The increasing complexity of forensic investigations and the rapid advancement of digital technologies have intensified the need for effective technology adoption within forensic laboratories. Despite substantial governmental investments in digital transformation initiatives in Abu Dhabi, inconsistent performance outcomes suggest that technology availability alone does not guarantee operational improvement. This study investigates the mediating influence of technology adoption on the relationship between organizational readiness factors and performance outcomes in forensic laboratories in Abu Dhabi. Grounded in the Technology–Organization–Environment (TOE) framework, Diffusion of Innovations (DOI) theory, and the Unified Theory of Acceptance and Use of Technology (UTAUT), the study conceptualizes organizational readiness as a higher-order construct comprising technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment. Performance outcomes are operationalized through accuracy, efficiency, speed, data management, and operational effectiveness. A quantitative research design was employed using structured survey instruments distributed to personnel across forensic laboratories in Abu Dhabi. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess measurement validity, structural relationships, and mediation effects. The findings indicate that organizational readiness factors significantly influence technology adoption. Moreover, technology adoption demonstrates a significant mediating effect in the relationship between organizational readiness and performance outcomes. While organizational readiness also exerts a direct positive effect on performance, the mediation results confirm that effective adoption and utilization of advanced technologies serve as the primary mechanism through which readiness conditions translate into measurable operational improvements. This study contributes to technology adoption literature by extending mediation-based models to the underexplored forensic laboratory context. Practically, the findings provide strategic insights for policymakers and laboratory managers in Abu Dhabi to enhance organizational preparedness and maximize returns on technological investments, thereby strengthening forensic performance and supporting the criminal justice system.

Keywords— Technology Adoption, Readiness Factors, Forensic Laboratories, Performance Results, UAE,

INTRODUCTION

Forensic laboratories constitute a fundamental component of modern criminal justice systems(Al-Matrouk et al., 2026). Their ability to produce accurate, reliable, and timely scientific evidence directly influences criminal investigations, judicial decisions, and public trust in law enforcement institutions (Al Shamsi, 2025). The increasing complexity of crime, particularly cybercrime and digital offenses, has accelerated the need for advanced forensic technologies and automated analytical systems.

Abu Dhabi has invested significantly in modernizing its forensic infrastructure through the adoption of international standards, accreditation systems, and digital technologies(Al Shamsi, 2025). These efforts align with the UAE's broader digital transformation agenda and its commitment to innovation-driven public services. However, technological investments alone do not guarantee improved performance. Organizations must possess

sufficient readiness capabilities to support successful technology implementation and utilization(Al Mansoori et al., 2018).

More critically, prior studies tend to examine technology adoption and performance outcomes as direct or independent relationships, without empirically testing the mechanism through which organizational readiness factors translate into performance improvements. Recent organizational and technology adoption literature highlights that technology adoption often functions as a mediating process, shaping how readiness factors are transformed into measurable performance outcomes (Mouakket & Aboelmaged, 2021; Ghaleb et al., 2021). Nevertheless, the mediating role of technology adoption remains underexplored in forensic science research, creating a clear empirical gap in understanding how and why performance improvements occur within forensic laboratories.

Although prior studies have extensively examined technology adoption, organizational readiness, and organizational performance across sectors such as healthcare, manufacturing, education, and public services, several important gaps remain unresolved in the existing literature. First, most studies conceptualize technology adoption either as a direct outcome of organizational readiness or as an independent predictor of organizational performance. However, limited studies have sufficiently examined technology adoption as a mediating mechanism through which organizational readiness conditions are transformed into measurable performance outcomes. Consequently, the process explaining how readiness factors generate performance improvement through adoption remains theoretically underdeveloped, particularly in highly specialized and knowledge-intensive environments such as forensic laboratories (Mouakket & Aboelmaged, 2021; Al Mansoori et al., 2018).

Organizational readiness encompasses the technological, human, structural, collaborative, and regulatory conditions that enable institutions to adopt and utilize new technologies effectively. Consequently, understanding the relationship between readiness factors, technology adoption, and performance outcomes is critical for achieving operational excellence in forensic laboratories. This study proposes that technology adoption mediates the relationship between organizational readiness factors and laboratory performance outcomes. The conceptual model is illustrated through five readiness dimensions influencing technology adoption, which subsequently enhances organizational performance.

THEORETICAL LITERATURE AND HYPOTHESIS DEVELOPMENT

TheTechnology–Organization–Environment (TOE) framework, the Diffusion of Innovations (DOI) theory, the Technology Acceptance Model (TAM), or the Unified Theory of Acceptance and Use of Technology (UTAUT). While these theories individually explain important aspects of adoption, they do not fully capture the multidimensional nature of technology adoption in complex organizational settings. TOE explains organizational and environmental readiness, DOI explains innovation diffusion, and UTAUT explains user acceptance and use behavior. However, limited studies have integrated these theories into a unified framework capable of simultaneously explaining organizational readiness conditions, innovation diffusion processes, and user acceptance mechanisms. This creates a theoretical gap in explaining technology adoption as a multi-level process linking readiness to performance (Nasrollahi & Ramezani, 2020; Ghaleb et al., 2021).

Organizational readiness factors

Organizational Readiness Factors refer to the conditions and capabilities that determine whether an organization is prepared to successfully implement and sustain change, transformation, or new initiatives (Weiner, 2020). While each factor technological infrastructure, human capital, organizational support, external collaborations, and the regulatory environment is critical in its own right, their collective influence often determines the success or failure of technology adoption initiatives. The synergistic effects of these factors underscore the need for a holistic approach to organizational readiness, where their interdependencies are fully considered and leveraged to maximize outcomes (Oikonomou et al., 2022).

Ttechnological infrastructure

The literature consistently identifies technological infrastructure as a fundamental enabler of technology adoption and organizational performance, particularly in technology-intensive environments. Studies across healthcare, manufacturing, public administration, and forensic science emphasize that infrastructure components such as hardware, software, communication networks, digital platforms, and cybersecurity systems collectively determine an organization's capacity to implement advanced technologies effectively (Croteau et al., 2001; Ahmed et al., 2019; Bruno et al., 2020). Within forensic laboratories, technological infrastructure is especially important because advanced forensic operations depend heavily on high-performance computational systems, integrated databases, secure digital environments, and specialized analytical technologies such as DNA sequencing platforms, digital forensics systems, and automated fingerprint identification systems (Ghaleb et al., 2021). Contextually, forensic laboratories in Abu Dhabi remain significantly underrepresented in technology adoption research despite their strategic importance and increasing technological dependence. Therefore, further empirical investigation is needed to examine how technological infrastructure shapes technology-enabled performance outcomes within forensic laboratories in Abu Dhabi.

Human capital

Human capital refers to the collective skills, knowledge, experience, and abilities of an organization's workforce (Pasban & Nojedeh, 2016). It plays a critical role in determining the organization's ability to adopt and effectively utilize new technologies. In forensic laboratories, human capital includes the technical expertise of forensic scientists and IT specialists who are essential for integrating and operating advanced forensic tools (Nasrollahi & Ramezani, 2020). A highly skilled and well-trained workforce is more likely to embrace technology adoption and contribute to improved performance outcomes.

Organizational support

Organizational support encompasses the resources, commitment, and leadership provided by an organization to facilitate technology adoption (Sulaeman et al., 2026). This includes financial investment, strategic direction, and the promotion of a culture that encourages innovation and the use of new technologies. In forensic laboratories, strong organizational support is essential for ensuring the successful adoption of advanced forensic tools, as it fosters a conducive environment for change and provides the necessary resources for training and infrastructure (Al Mansoori et al., 2018).

External collaborations

External collaborations refer to the partnerships and interactions between an organization and external entities, such as technology providers, research institutions, and industry associations. These collaborations can provide access to the latest technological advancements, technical support, and opportunities for knowledge exchange. For forensic laboratories, engaging in external collaborations can facilitate the adoption of cutting-edge technologies and enhance the laboratory's overall capabilities (Almehairbi et al., 2022).

The regulatory environment

The regulatory environment includes the laws, regulations, and standards that govern an organization's operations, particularly regarding the adoption and use of new technologies. In forensic laboratories, the regulatory environment plays a crucial role in ensuring that the adoption of new technologies complies with legal and ethical standards, particularly in handling sensitive data and evidence. A supportive regulatory environment provides clear guidelines that encourage technological innovation, while a restrictive environment may hinder adoption efforts (Marcon et al., 2021).

Technology adoption

Technology adoption refers to the process by which an organization embraces and integrates new technologies into its existing operations to improve efficiency, productivity, and overall performance. In the context of forensic laboratories, technology adoption involves implementing advanced forensic tools and digital platforms

to enhance the accuracy and speed of forensic analysis (Haddad et al., 2019). The level of technology adoption within an organization depends on several factors, including technological readiness, organizational support, and external collaborations.

Performance outcomes

Performance outcomes are the measurable results that reflect the effectiveness of an organization's processes and operations. In forensic laboratories, performance outcomes are often assessed in terms of accuracy, efficiency, data management, and operational effectiveness (Shwedeh et al., 2022).The performance outcomes of forensic laboratories are critical indicators of their ability to fulfill their roles within the criminal justice system. These outcomes are multidimensional and include metrics such as accuracy, efficiency, speed, data management, and operational effectiveness (Hasani, 2024). Each metric is influenced by the adoption of advanced technologies and the level of organizational readiness. Understanding these factors is essential for improving forensic operations and ensuring the delivery of justice.

Accuracy

Accuracy in forensic laboratories refers to the precision and correctness of forensic analyses and conclusions. It is a critical performance metric, as accurate forensic results are essential for supporting criminal investigations and ensuring justice is served. The adoption of advanced forensic technologies can significantly enhance accuracy by reducing human error and improving the reliability of evidence analysis (Shwedeh et al., 2022).

Efficiency

Efficiency refers to the ability of an organization to perform tasks with optimal use of time, resources, and effort. In forensic laboratories, efficiency is often measured by the speed at which evidence is processed and analyzed. Technology adoption can enhance efficiency by automating repetitive tasks, streamlining workflows, and reducing the time required for forensic analyses, allowing laboratories to handle more cases in less time (Gaddam, 2019).

Data management

Data management involves the systematic handling, storage, and retrieval of data to ensure its accuracy, security, and accessibility (Freitas et al., 2026). In forensic laboratories, effective data management is crucial for maintaining the integrity of forensic evidence, complying with legal standards, and ensuring that data can be easily accessed when needed. The adoption of digital forensics platforms and data management systems can significantly improve how laboratories manage large volumes of evidence and data (Al Mansoori et al., 2018).

Operational effectiveness

Operational effectiveness refers to the overall ability of an organization to achieve its objectives efficiently and effectively (Mondal et al., 2025). In forensic laboratories, operational effectiveness is determined by how well the laboratory manages its resources, personnel, and technologies to deliver high-quality forensic services. Technology adoption plays a key role in enhancing operational effectiveness by optimizing processes, improving coordination among departments, and ensuring that forensic analyses are conducted in a timely and reliable manner (Nasrollahi & Ramezani, 2020).

Hypotheses development

The influence of technological infrastructure on technology adoption

In forensic laboratories, technological infrastructure plays an especially critical role due to the complexity and precision required in forensic analysis. Laboratories equipped with updated systems are more likely to adopt and implement these tools efficiently, as the infrastructure aligns with technological requirements and reduces potential compatibility issues (Ghaleb et al., 2021).One key aspect of technological infrastructure is its influence on reducing barriers to technology adoption. When infrastructure is inadequate such as outdated hardware or

lack of connectivity it can hinder the adoption process, leading to delays, inefficiencies, and potential resistance from users (Nasrollahi & Ramezani, 2020). Furthermore, the alignment between technological infrastructure and organizational readiness enhances the likelihood of successful adoption. Infrastructure not only supports the deployment of tools but also serves as a catalyst for creating an innovation-friendly environment. Studies have shown that organizations with robust infrastructure are better positioned to support training programs, optimize resource allocation, and foster user engagement, all of which contribute to higher adoption rates (Blut & Wang, 2019). In forensic laboratories, the alignment of infrastructure with other organizational readiness factors, such as human capital and leadership support, can amplify the benefits of technological investments.

Empirical evidence supports the positive relationship between technological infrastructure and technology adoption. For example, a study by Almehairbi et al. (2022) found that well-equipped laboratories were more likely to integrate advanced forensic tools, citing infrastructure as a key determinant of readiness. Similarly, Marcon et al. (2021) highlighted the role of infrastructure in enabling rapid adoption in technology-intensive sectors, emphasizing its importance in maintaining operational continuity during transitions.

H1: Technological infrastructure positively influences technology adoption in forensic laboratories.

The role of human capital in technology adoption

In forensic laboratories, the role of human capital becomes even more pronounced due to the specialized nature of forensic analysis. Advanced technologies such as automated DNA sequencing, digital forensic tools, and machine learning algorithms for pattern recognition require technical expertise and precision. The successful adoption of these tools hinges on the workforce's ability to not only operate them but also interpret their outputs accurately (Kaewsaengon, 2024). For instance, digital forensic analysts must possess both the technical skills to use sophisticated software and the analytical expertise to derive meaningful insights from complex datasets. A workforce equipped with such skills enhances the likelihood of successful technology adoption and improves overall organizational performance.The availability of training and development programs is critical to building human capital that supports technology adoption. These programs allow employees to acquire the necessary competencies to operate new technologies, reducing the learning curve and minimizing resistance to change (Nasrollahi & Ramezani, 2020).

Empirical studies reinforce the importance of human capital in technology adoption. For instance, a study by Almehairbi et al. (2022) demonstrated that organizations with highly skilled employees were more likely to adopt advanced technologies successfully, citing workforce competency as a key determinant. Similarly, research by Ruangkanjanases et al. (2022) highlighted that continuous professional development initiatives significantly enhance employees' readiness to adopt and utilize new tools.

H2: Human capital positively influences technology adoption in forensic laboratories.

The Impact of organizational support on technology adoption

Organizational support also addresses the human element of technology adoption by reducing uncertainty and building employee confidence. Resistance to change often arises when employees feel unprepared or fear that new technologies might disrupt their workflows or threaten their roles (Ruangkanjanases et al., 2022). Supportive management can counter these concerns by providing clear communication, continuous training, and assurances of job security. For instance, forensic laboratory managers who emphasize the benefits of technology adoption, such as improved accuracy and efficiency, can help staff see the value in transitioning to new systems, thereby increasing their willingness to adapt.

Studies have highlighted the relationship between organizational support and successful technology adoption. For example, Almehairbi et al. (2022) found that organizations with strong leadership commitment and resource allocation experienced higher rates of adoption and integration of advanced technologies. Similarly, research by Niguse et al. (2025) underscores the role of a supportive organizational culture in fostering innovation and adaptability, both of which are essential for navigating the challenges of technology adoption.

H3: Organizational support positively influences technology adoption in forensic laboratories.

The effect of external collaborations on technology adoption

External collaborations, which involve strategic partnerships with technology providers, research institutions, industry associations, and other organizations, play a critical role in facilitating technology adoption. These collaborations enable organizations to access advanced technologies, specialized expertise, and innovative solutions that may not be readily available in-house. For forensic laboratories, which often operate in a highly specialized and resource-intensive field, such partnerships are invaluable for ensuring the successful adoption and utilization of advanced tools and systems (Duhamel et al., 2022).

Empirical evidence supports the positive impact of external collaborations on technology adoption. Studies have shown that organizations engaged in strategic partnerships are more likely to adopt and integrate advanced technologies effectively. For example, Marcon et al. (2021) found that collaborative relationships with technology providers and research institutions significantly improved the adoption rates of digital tools in forensic laboratories. Similarly, Mouakket and Aboelmaged (2021) emphasized the role of industry partnerships in fostering innovation and technological advancements, highlighting the importance of external support in overcoming adoption challenges. .

H4: External collaborations positively influence technology adoption in forensic laboratories.

The influence of regulatory environment on technology adoption

The regulatory environment plays a pivotal role in shaping the adoption of technology within forensic laboratories. Comprising the laws, regulations, ethical guidelines, and standards that govern forensic practices, the regulatory environment establishes the framework within which laboratories operate. Adhering to these standards is essential for maintaining the credibility, reliability, and admissibility of forensic evidence in the criminal justice system. A well-defined and supportive regulatory environment encourages technology adoption by providing clarity, reducing uncertainty, and mitigating risks associated with the integration of advanced technologies (Marcon et al., 2021).

Empirical evidence supports the positive relationship between a supportive regulatory environment and technology adoption. Studies have shown that organizations operating in industries with clear and adaptive regulatory frameworks are more likely to adopt and utilize advanced technologies effectively. For example, Ghaleb et al. (2021) highlighted how regulatory guidelines on evidence handling encouraged forensic laboratories to implement digital evidence management systems, enhancing both efficiency and compliance. Similarly, Marcon et al. (2021) emphasized the role of regulatory support in fostering innovation, noting that laboratories with access to regulatory guidance were more inclined to adopt cutting-edge tools for forensic analysis.

H5: A supportive regulatory environment positively influences technology adoption in forensic laboratories.

The mediating role of technology adoption in the relationship between organizational readiness and performance outcomes

Technology adoption is a critical intermediary that bridges organizational readiness and enhanced performance outcomes in forensic laboratories. While organizational readiness factors such as technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment directly contribute to performance, their full potential is often realized through the successful integration and utilization of advanced technologies (Duhamel et al., 2022). Technology adoption not only amplifies the benefits of organizational readiness but also introduces transformative capabilities that redefine how forensic laboratories operate.

The mediating role of technology adoption is particularly evident in the relationship between technological infrastructure and performance outcomes. While state-of-the-art hardware, software, and networks are essential for supporting forensic operations, their impact is maximized when laboratories adopt technologies that leverage

these assets effectively. For instance, the presence of high-performance computing systems can enhance the processing of complex forensic datasets, but the benefits are contingent upon the laboratory's ability to integrate and utilize advanced forensic software. Similarly, the adoption of laboratory information management systems (LIMS) is instrumental in improving case management and resource allocation, translating organizational infrastructure into measurable performance gains (Marcon et al., 2021).

Human capital also benefits from the mediating influence of technology adoption. Skilled personnel are better equipped to leverage the capabilities of advanced tools, translating their expertise into improved accuracy and efficiency in forensic analyses. Training programs aimed at familiarizing staff with new technologies further enhance this synergy, enabling laboratories to maximize the impact of their human capital investments. For example, forensic scientists trained to use artificial intelligence algorithms for digital evidence analysis can process complex datasets more accurately and quickly, demonstrating how technology adoption amplifies the contributions of human capital to performance outcomes (Duhamel et al., 2022).

Organizational support plays a pivotal role in facilitating technology adoption, thereby influencing performance outcomes. Supportive leadership, resource allocation, and a culture of innovation are crucial for overcoming resistance to change and ensuring the successful integration of new technologies. Laboratories that foster an innovation-friendly environment are more likely to adopt advanced tools and integrate them into their workflows seamlessly. This integration enhances performance metrics such as operational effectiveness, as laboratories become more agile and responsive to the demands of criminal investigations (Almehairbi et al., 2022).

External collaborations also benefit from the mediating influence of technology adoption. Partnerships with technology providers, research institutions, and industry associations provide laboratories with access to cutting-edge tools, technical expertise, and training opportunities. However, the benefits of these collaborations are realized only when laboratories actively adopt and integrate the technologies and knowledge gained through these partnerships. For example, collaborations with technology providers may introduce advanced evidence analysis systems, but their impact on performance outcomes such as speed and data management depends on the laboratory's readiness to adopt and utilize these systems effectively (Kaewsaengon, 2024).

The regulatory environment further underscores the importance of technology adoption as a mediating factor. Supportive regulations that provide clear guidelines for technology use encourage laboratories to adopt innovations that enhance compliance, accuracy, and operational effectiveness. For instance, laboratories operating under regulatory frameworks that endorse digital evidence management systems are more likely to adopt these systems, leading to improved data security and streamlined workflows. Conversely, laboratories in restrictive regulatory environments may struggle to realize the full benefits of their organizational readiness due to barriers to technology adoption (Balasubramanian et al., 2021).

Empirical studies support the mediating role of technology adoption in linking organizational readiness to performance outcomes. For example, Ghaleb et al. (2021) found that the adoption of big data technologies in healthcare organizations significantly enhanced performance outcomes when mediated by organizational readiness factors such as infrastructure and human capital. Similarly, Mouakket and Aboelmaged (2021) demonstrated that the adoption of green information technologies in service organizations amplified the positive effects of organizational readiness on sustainability performance. These findings highlight the transformative potential of technology adoption in realizing the benefits of organizational readiness across various contexts.

H6: Technology adoption mediates the relationship between organizational readiness factors (technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment) and performance outcomes (accuracy, efficiency, speed, data management, and operational effectiveness) in forensic laboratories.

The direct impact of organizational readiness factors on performance outcomes

While technology adoption serves as a critical mediator in enhancing performance outcomes, organizational readiness factors also exert a direct influence on the operational success of forensic laboratories. This relationship underscores the importance of robust organizational foundations in ensuring the efficiency,

accuracy, and overall effectiveness of forensic processes, even in the absence of advanced technology integration. Organizational readiness comprising technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment has the capacity to independently drive performance improvements by enabling seamless workflows, consistent quality control, and effective resource management (Marcon et al., 2021).

Empirical evidence supports the direct influence of organizational readiness factors on performance outcomes. For instance, Ghaleb et al. (2021) found that organizations with robust infrastructure and skilled personnel achieved better performance metrics, even in the absence of comprehensive technology adoption. Similarly, studies in healthcare and manufacturing sectors have demonstrated that strong organizational support and collaborative networks are associated with improved operational efficiency and accuracy, highlighting the universal applicability of this relationship (Ruangkanjanases et al., 2022).

H7: Organizational readiness factors (technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment) directly influence performance outcomes (accuracy, efficiency, speed, data management, and operational effectiveness) in forensic laboratories in Abu Dhabi.

The research framework

This study proposes a conceptual framework that examines the mediating role of technology adoption in the relationship between organizational readiness factors and performance outcomes in forensic laboratories in Abu Dhabi. The framework is grounded in the Technology–Organization–Environment (TOE) framework and Digital Forensic Readiness Theory, which emphasize the importance of organizational preparedness in facilitating successful technology implementation and enhancing organizational performance.

The proposed model identifies five organizational readiness factors as independent variables: technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment. These factors represent the technological, human, organizational, and environmental conditions necessary for successful technology adoption within forensic laboratories.

Technology adoption is positioned as the mediating variable because readiness factors alone may not directly improve organizational performance. Instead, organizations must effectively adopt and utilize advanced forensic technologies to translate readiness into measurable outcomes. The adoption of technologies such as digital forensic systems, artificial intelligence applications, automated DNA analysis, biometric identification systems, and Laboratory Information Management Systems (LIMS) enables laboratories to improve operational processes and service delivery.

The dependent variable, performance outcomes, is measured through five dimensions: accuracy, efficiency, speed, data quality, and operational effectiveness. These indicators reflect the overall effectiveness and quality of forensic laboratory operations.

The framework proposes that technological infrastructure, human capital, organizational support, external collaborations, and the regulatory environment positively influence technology adoption (H1–H5). Furthermore, technology adoption positively influences performance outcomes (H6). Finally, technology adoption mediates the relationship between organizational readiness factors and performance outcomes (H7).

Accordingly, the proposed research framework suggests that forensic laboratories with higher levels of organizational readiness are more likely to successfully adopt advanced technologies, which subsequently enhance laboratory performance. The framework provides a comprehensive model for understanding how organizational preparedness contributes to digital transformation and operational excellence in forensic laboratories in Abu Dhabi.. Finally, there are seven hypotheses identified in Fig. 1.

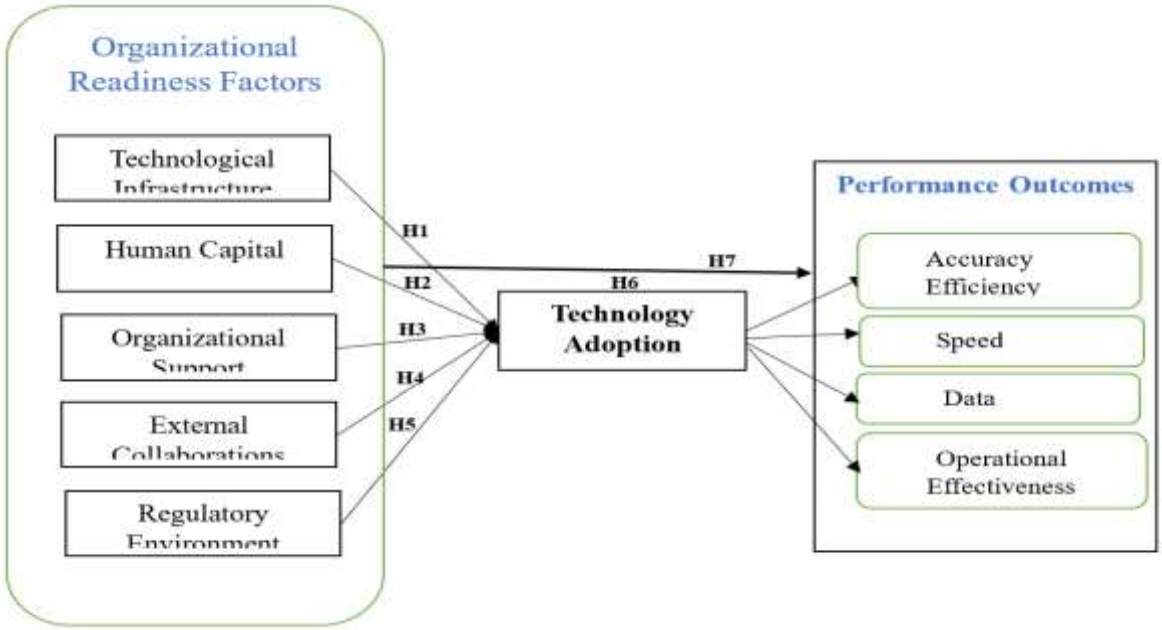

Fig. 1. Research framework

METHODOLOGY

Abu Dhabi forensic laboratories were selected due to their strategic role within the UAE's criminal justice system and their alignment with national digital transformation initiatives. These laboratories operate in a highly regulated, technology-intensive environment, making them a suitable context for examining the interplay between organizational readiness, technology adoption, and performance outcomes.

To ensure representation across different functional roles, stratified random sampling is employed for the quantitative component of the study. This sampling technique is appropriate when the population is heterogeneous and consists of identifiable subgroups (Otzen & Manterola, 2017). In this study, the population is stratified according to job roles (e.g., forensic scientists, IT personnel, and managerial staff).

The sample size for the quantitative phase is determined using established statistical and methodological guidelines. According to commonly used sample size calculators (e.g., Qualtrics Sample Size Calculator), a sample of approximately 200 respondents is adequate for a population of 400–500 at a 95% confidence level and a 5% margin of error. In addition, because the study employs Partial Least Squares Structural Equation Modeling (PLS-SEM), sample size adequacy is further justified using the 10-times rule, which recommends a minimum sample size equal to ten times the maximum number of structural paths directed at any endogenous construct (Hair et al., 2019). In the proposed model, the construct Technology Adoption receives paths from five organizational readiness factors, suggesting a minimum sample of 50–60 respondents. To ensure sufficient statistical power, model stability, and robustness of parameter estimates, the study targets a substantially larger sample ($N \geq 150$), which exceeds both requirements and supports mediation analysis.

Total of 230 questionnaires were distributed to employees working in forensic laboratories in Abu Dhabi. Out of these, 200 questionnaires were returned, yielding a response rate of 86.95%. This response rate is considered exceptionally high for survey research and exceeds the minimum thresholds commonly suggested in social science and management research (Sekaran & Bougie, 2016). Only 30 questionnaires (13.04%) were not returned, and importantly, there were no incomplete responses, indicating strong participant commitment and careful completion of the survey instrument. Data collection was conducted over a six-week period. The completed responses were downloaded from the online data collection platform and analyzed using Smart PLS for structural equation modeling. The data were initially recorded and organized within the online platform according to the response structure before being exported for statistical analysis.

Demographic analysis

Table 1 shows the respondents profile for those who participated in the research. The results in Table 1 the sample consisted of 193 male respondents (55.5%) and 155 female respondents (44.5%), indicating a relatively balanced representation of both groups, with a slightly higher proportion of males. In terms of age distribution, the majority of participants fell within the middle age categories. Specifically, 141 respondents (40.5%) were between 35 and 45 years, followed by 131 respondents (37.6%) aged 25 to 34 years. Younger participants aged 18 to 24 years accounted for 65 respondents (18.7%), while only 11 respondents (3.2%) were above 45 years. This distribution suggests that the workforce in Abu Dhabi forensic laboratories is largely composed of individuals in their prime professional and career development stages. Regarding educational qualifications, respondents demonstrated a high level of academic attainment. The largest proportion held a high school qualification or equivalent (27.6%), while PhD holders represented 26.1% of the sample. Additionally, 23.6% possessed a master's degree, and 22.7% held a bachelor's degree. This educational profile reflects a diverse yet highly educated respondent group, which is consistent with the specialized nature of forensic laboratory work and the increasing reliance on advanced technologies and scientific expertise. the demographic distribution indicates that the study sample represents a knowledgeable and professionally mature population, providing an appropriate basis for examining technology adoption and performance outcomes in forensic laboratories.

Table 1. Profile of Respondents (N = 348)

Demographic Variable	Category	Frequency (n)	Percent (%)
Gender	Male	193	55.5
	Female	155	44.5
	Total	348	100
Age	18 – 24	65	18.7
	25 – 34	131	37.6
	35 – 45	141	40.5
	> 45	11	3.2
	Total	348	100
Education Level	High school or equivalent	96	27.6
	Bachelor's degree	79	22.7
	Master	82	23.6
	PhD	91	26.1
	Total	348	100

Measurement Model Evaluation

Internal consistency reliability was subsequently assessed to determine the extent to which the indicators of each construct consistently measure the same underlying concept. Both Cronbach's alpha and composite reliability were employed, as composite reliability is considered particularly appropriate in PLS-SEM due to its ability to account for differences in indicator loadings (Ahmed et al., 2019; Mouakket & Aboelmaged, 2021). The results presented in Table 4.18 confirm that all constructs exceeded the recommended threshold of 0.70, demonstrating strong internal consistency. External Collaborations achieved $\alpha = 0.936$ and CR = 0.937, Technology Adoption reported $\alpha = 0.943$ and CR = 0.944, Performance Outcomes recorded $\alpha = 0.943$ and CR = 0.951, and Technological Infrastructure showed $\alpha = 0.925$ and CR = 0.929. These high reliability values indicate that the measurement scales are robust and suitable for examining organizational readiness and technology adoption processes within forensic laboratories, consistent with prior research emphasizing the importance of reliable measurement in technology-driven institutional environments (Haddad et al., 2019).

Convergent validity was examined through the Average Variance Extracted (AVE), which reflects the extent to which a construct explains the variance of its indicators. AVE values above 0.50 indicate that the construct accounts for more than half of the variance in its observed measures, thereby confirming adequate convergence (Ghaleb et al., 2021; Nasrollahi & Ramezani, 2020). As shown in Table 4.18, all constructs achieved AVE

values well above the acceptable threshold, including EC (0.759), HC (0.720), OS (0.722), RE (0.757), TA (0.778), TI (0.772), and PO (0.616). These findings confirm strong convergent validity across the measurement model. Notably, Technology Adoption demonstrated the highest AVE, indicating particularly strong coherence among adoption-related indicators within Abu Dhabi forensic laboratories. Although Performance Outcomes recorded the lowest AVE, the value remains above the required minimum, suggesting acceptable convergence given the multidimensional nature of performance assessment in forensic contexts (Almessabi & Kamalrudin, 2022; Altayari et al., 2023).

The reflective measurement model demonstrates excellent psychometric quality. The combination of strong indicator loadings, high internal consistency reliability, and satisfactory AVE values confirms that the measurement instrument is robust, internally consistent, and valid for assessing organizational readiness dimensions, technology adoption, and performance outcomes in Abu Dhabi forensic laboratories. These results provide a solid empirical foundation for advancing to the structural model assessment, where the hypothesized causal relationships among readiness factors, technology adoption, and institutional performance outcomes will be examined (Almehairbi et al., 2022; Mouakket & Aboelmaged, 2021). These improvements are further summarized in Table 2, which displays the loadings, Cronbach's alpha, CR, and AVE values for each construct in the final model.

Table 2. Construct Reliability and Validity - Final Model measurements

	Loading	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
EC1	0.883	0.936	0.937	0.759
EC2	0.896			
EC3	0.875			
EC4	0.845			
EC5	0.885			
EC6	0.841			
HC1	0.602	0.897	0.919	0.720
HC2	0.901			
HC3	0.886			
HC4	0.921			
HC5	0.890			
OS1	0.844	0.904	0.910	0.722
OS2	0.886			
OS3	0.800			
OS4	0.868			
OS5	0.848			
PO1	0.799	0.943	0.951	0.616
PO10	0.835			
PO11	0.737			
PO12	0.625			
PO2	0.803			
PO3	0.855			
PO4	0.748			
PO5	0.693			
PO6	0.813			
PO7	0.782			
PO8	0.859			
PO9	0.835			
RE1	0.898	0.893	0.895	0.757
RE2	0.840			

RE3	0.895			
RE4	0.846			
TA1	0.897	0.943	0.944	0.778
TA2	0.912			
TA3	0.909			
TA4	0.874			
TA5	0.830			
TA6	0.867			
TI1	0.929	0.925	0.929	0.772
TI2	0.847			
TI3	0.914			
TI4	0.883			
TI5	0.815			

CR= Composite Reliability; AVE= Average Variance Extracted

Discriminate Validity

As displayed in Table 3, all HTMT values are below the conservative threshold of 0.85, confirming satisfactory discriminant validity across the constructs. Discriminant validity was assessed using the heterotrait–monotrait ratio of correlations (HTMT), which is considered one of the most rigorous criteria for evaluating construct distinctiveness in PLS-SEM. HTMT assesses whether correlations between different constructs are sufficiently lower than correlations among indicators within the same construct. Values below 0.85 indicate strong discriminant validity, while values above 0.90 may suggest conceptual overlap between constructs (Blut & Wang, 2019; Kaewsaengon, 2024).

As presented in Table 4.19, all HTMT values were below the conservative threshold of 0.85, confirming that discriminant validity was established across the measurement model. For example, the HTMT value between External Collaborations and Human Capital was 0.796, while Organizational Support and Regulatory Environment recorded a value of 0.789. Similarly, the HTMT value between Technology Adoption and Technological Infrastructure was 0.788. These values show that the constructs are related but not redundant, meaning that each construct captures a distinct dimension of the study model.

This finding is particularly important because organizational readiness factors in forensic laboratories are theoretically interconnected. Technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment all contribute to readiness, but they represent different institutional capabilities. For example, technological infrastructure reflects systems and digital resources, human capital reflects workforce expertise, organizational support reflects leadership and resources, external collaborations reflect innovation networks, and regulatory environment reflects legal and compliance conditions. The HTMT results confirm that respondents were able to distinguish among these constructs, supporting the conceptual clarity of the integrated framework.

The discriminant validity findings also strengthen the theoretical robustness of the TOE-based structure adopted in this study. Since TOE assumes that technological, organizational, and environmental dimensions jointly influence adoption, it is important that these dimensions remain empirically distinguishable. The HTMT results confirm that although the readiness dimensions are positively related, they do not measure the same concept. This supports the argument that organizational readiness is multidimensional rather than a single undifferentiated construct (Almehairbi et al., 2022; Haddad et al., 2019).

The combined evidence from AVE and HTMT confirms that the measurement model demonstrates strong construct validity. The constructs show adequate convergence and clear discriminant boundaries, indicating that the instrument is psychometrically sound. This provides a reliable foundation for proceeding to structural model evaluation and hypothesis testing, particularly for examining how organizational readiness factors influence technology adoption and performance outcomes in Abu Dhabi forensic laboratories (Mouakket & Aboelmaged,

2021).

Table 3.The heterotrait-monotrait ratio of correlations (HTMT)

	EC	HC	OS	PO	RE	TA	TI
EC							
HC	0.796						
OS	0.600	0.768					
PO	0.645	0.735	0.732				
RE	0.681	0.776	0.789	0.774			
TA	0.611	0.685	0.764	0.613	0.781		
TI	0.610	0.658	0.700	0.627	0.660	0.788	

TI: Technological Infrastructure; HC: Human Capital; OS: Organizational Support; EC: External Collaborations; RE: Regulatory Environment; TA: Technology Adoption; PO: Performance Outcomes

Hypotheses Testing

Testing hypotheses is the most important test in the current research since it shows whether or not the goals of the research were met. Since there is a mediation in the current research, the direct effect test, and the indirect effect test will be used to examine the hypotheses. The following Fig. 2 shows the results of the direct effect test followed by some explanations.

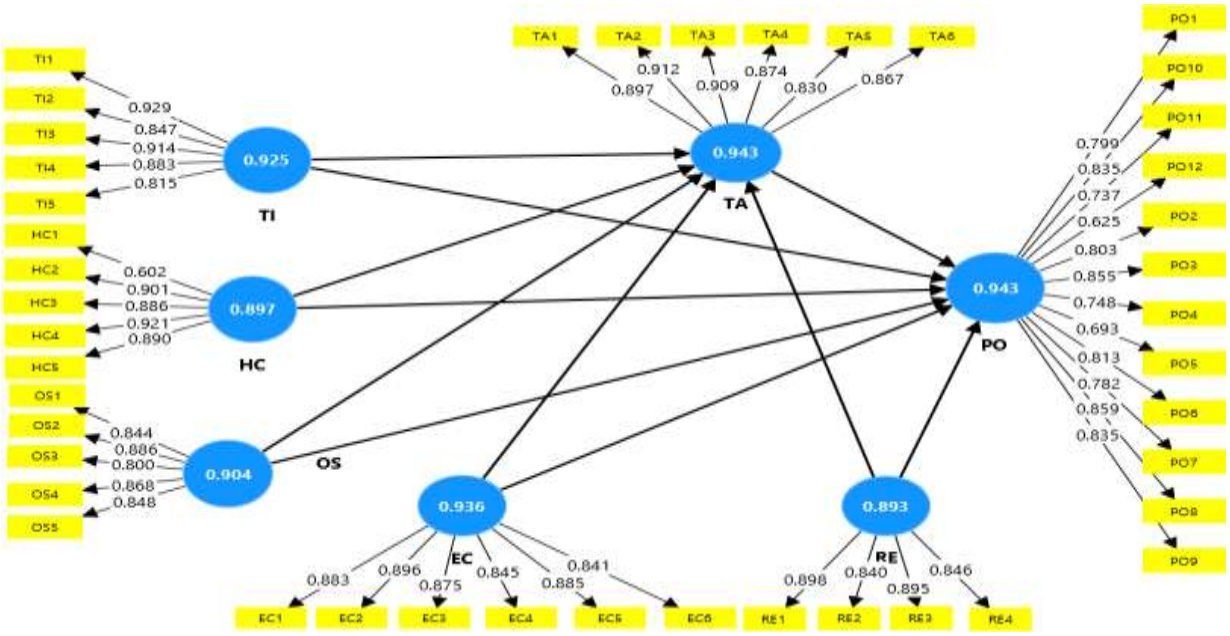

Fig. 2. Path Model Significance Results

Through the use of PLS-SEM, all of the research's hypotheses have been verified. A good match is suggested by the statistical finding. There are a total of seven hypotheses in the entire model. The t-value is taken into account when evaluating the structural relationships between the variables that have been identified for this research. In, the authors state that for a t-value to be deemed statistically significant, it must be 1.96 or above (one-tailed). The direct effect test, one sort of hypothesis testing, was employed in this research.

Hypothesis Testing (Direct Effect)

This section presents the result of hypotheses testing for direct effect. The direct effect test aims to examine the relationships between the independent variables and the dependent variable. The direct hypotheses (H1–H5) were evaluated through the bootstrapped path coefficients.

The hypotheses were tested using the PLS-SEM bootstrapping procedure, which generated standardized beta coefficients, t-statistics, and p-values to determine the statistical significance of each proposed relationship. This approach is widely applied in technology adoption and organizational readiness research, as it allows for robust evaluation of complex causal models involving multiple predictors, mediators, and outcome constructs (Mouakket & Aboelmaged, 2021; Almehairbi et al., 2022).

Hypothesis 1 proposed that technological infrastructure positively influences technology adoption in forensic laboratories. The empirical results indicated a positive but statistically non-significant relationship between Technological Infrastructure and Technology Adoption ($\beta = 0.136$, $p = 0.058$). Therefore, H1 was not supported. This finding suggests that while infrastructure capability is an important foundational condition, it does not independently drive adoption decisions unless supported by stronger institutional or regulatory enablers.

Hypothesis 2 examined the influence of human capital on technology adoption. The results revealed that Human Capital had no statistically significant effect on Technology Adoption ($\beta = 0.100$, $p = 0.297$). Consequently, H2 was rejected. This implies that employee skills and expertise, although essential for operational readiness, may not directly translate into adoption behavior within highly regulated forensic environments, where adoption is shaped more strongly by external governance and compliance requirements.

Hypothesis 3 proposed that organizational support positively influences technology adoption. However, the findings showed a negative and non-significant relationship between Organizational Support and Technology Adoption ($\beta = -0.063$, $p = 0.402$). Thus, H3 was not supported. This result indicates that leadership encouragement alone may be insufficient to trigger adoption unless accompanied by regulatory facilitation and collaborative innovation structures.

Hypothesis 4 posited that external collaborations positively influence technology adoption. The results confirmed a significant positive relationship between External Collaborations and Technology Adoption ($\beta = 0.261$, $p < 0.001$). Therefore, H4 was supported. This finding highlights the critical role of partnerships with external experts, technology providers, and research institutions in accelerating adoption processes and strengthening innovation capacity in forensic laboratories.

Hypothesis 5 proposed that a supportive regulatory environment positively influences technology adoption. The findings strongly supported this hypothesis, as Regulatory Environment demonstrated the largest and most significant effect on Technology Adoption ($\beta = 0.556$, $p < 0.001$). Hence, H5 was supported. This emphasizes that regulatory clarity, legal compliance frameworks, and institutional governance are decisive adoption drivers in forensic contexts, where technological tools must meet strict evidentiary and legal standards. Hypothesis 6 proposed that organizational readiness factors directly influence performance outcomes. The results provided mixed evidence. Regulatory Environment ($\beta = 0.392$, $p < 0.001$) and External Collaborations ($\beta = 0.236$, $p = 0.002$) demonstrated significant direct effects on Performance Outcomes, supporting the importance of regulatory facilitation and external innovation networks in improving laboratory effectiveness. In contrast, Technological Infrastructure, Human Capital, and Organizational Support did not show significant direct relationships with performance outcomes. Thus, H6 was partially supported, suggesting that performance improvements are primarily driven by regulatory readiness, external partnerships, and the successful adoption of technologies rather than internal resource factors alone., albeit with the understanding that the relationship is contextually dynamic and time-dependent as shown in Table 4.

Table 4. Direct Hypotheses

Hypotheses	Beta	Sample Mean (M)	SD	T statistics	P values	Decision
EC -> PO	0.236	0.235	0.078	3.039	0.002	Supported
EC -> TA	0.261	0.254	0.069	3.780	0.000	Supported
HC -> PO	0.079	0.078	0.088	0.896	0.370	Rejected
HC -> TA	0.100	0.098	0.096	1.043	0.297	Rejected
OS -> PO	0.093	0.095	0.085	1.101	0.271	Rejected
OS -> TA	-0.063	-0.058	0.075	0.838	0.402	Rejected
RE -> PO	0.392	0.394	0.073	5.407	0.000	Supported

RE -> TA	0.556	0.558	0.071	7.844	0.000	Supported
TA -> PO	0.584	0.590	0.100	5.864	0.000	Supported
TI -> PO	0.132	0.131	0.090	1.467	0.142	Rejected
TI -> TA	0.136	0.139	0.072	1.899	0.058	Rejected

TI: Technological Infrastructure; HC: Human Capital; OS: Organizational Support; EC: External Collaborations; RE: Regulatory Environment; TA: Technology Adoption; PO: Performance Outcomes .

Hypothesis Testing (Mediation Effect)

Hypothesis 7 examined whether Technology Adoption mediates the relationship between organizational readiness factors and performance outcomes. The mediation analysis revealed partial support for this hypothesis. Technology Adoption significantly mediated the effects of Regulatory Environment ($\beta = 0.325$, $p < 0.001$) and External Collaborations ($\beta = 0.153$, $p = 0.001$) on Performance Outcomes. However, mediation was not supported for Technological Infrastructure, Human Capital, or Organizational Support. Therefore, H7 was partially supported, indicating that technology adoption serves as a key mechanism through which regulatory support and collaborative engagement enhance forensic performance, while other readiness factors may influence performance through alternative or indirect pathways. (Hair et al., 2019) as in Table 5.

Table 5. Mediation Testing (Indirect Effect)

Hypotheses	Beta	Sample Mean (M)	SD	T statistics	P values	Decision
RE -> TA -> PO	0.325	0.331	0.078	4.169	0.000	Supported
TI -> TA -> PO	0.080	0.082	0.045	1.770	0.077	Rejected
EC -> TA -> PO	0.153	0.149	0.046	3.326	0.001	Supported
HC -> TA -> PO	0.059	0.056	0.057	1.028	0.304	Rejected
OS -> TA -> PO	-0.037	-0.033	0.044	0.826	0.409	Rejected

TI: Technological Infrastructure; HC: Human Capital; OS: Organizational Support; EC: External Collaborations; RE: Regulatory Environment; TA: Technology Adoption; PO: Performance Outcomes.

RESULT AND DISCUSSION

The findings of this study demonstrate that organizational readiness constitutes a foundational institutional capability shaping technology adoption within forensic laboratories in Abu Dhabi. Rather than functioning as isolated determinants, technological infrastructure, human capital, organizational support, external collaborations, and regulatory environment collectively create the organizational conditions necessary for adoption capability. This finding strongly supports the central assumption of the Technology–Organization–Environment (TOE) framework that technology adoption is influenced by the interaction of technological, organizational, and environmental conditions rather than by technological resources alone (Nasrollahi & Ramezani, 2020; Ghaleb et al., 2021). The results therefore indicate that forensic laboratory modernization depends on the collective alignment of internal organizational preparedness and external institutional support mechanisms.

The findings further suggest that organizational readiness in forensic laboratories should be understood as an interdependent and systemic capability rather than a fragmented collection of independent organizational resources. Technological infrastructure provides the technical foundation necessary for digital integration and operational continuity, while human capital contributes the expertise and absorptive capacity required to operationalize advanced systems effectively. Organizational support strengthens implementation coordination through leadership commitment, strategic direction, and resource allocation. External collaborations facilitate access to technological expertise, innovation networks, and specialized knowledge, whereas the regulatory environment establishes institutional legitimacy and procedural acceptance for technology implementation. Collectively, these readiness dimensions shape the ability of forensic laboratories to adopt and institutionalize

advanced forensic technologies successfully. This interpretation extends prior readiness literature by demonstrating that adoption capability emerges through the interaction among readiness dimensions rather than through isolated organizational factors operating independently (Nair et al., 2019; Mouakket & Aboelmaged, 2021).

One of the most significant findings of this study is the mediating role of technology adoption in the relationship between organizational readiness and performance outcomes. The findings suggest that organizational readiness alone is insufficient to generate measurable operational improvements unless readiness conditions are transformed into actual technology utilization. In other words, readiness factors such as infrastructure, human capital, organizational support, external collaborations, and regulatory environment create the conditions for improvement, but performance gains occur when these conditions are converted into effective adoption and use of advanced forensic technologies. This indicates that technology adoption functions as a critical transformational mechanism linking organizational capability to forensic performance outcomes (Nasrollahi & Ramezani, 2020; Ghaleb et al., 2021; Mouakket & Aboelmaged, 2021).

Theoretically, this finding extends existing technology adoption literature by shifting the conceptual role of technology adoption from a direct outcome variable toward a process-oriented explanatory mechanism. Prior studies frequently conceptualize technology adoption either as an organizational objective or as an independent predictor of performance. However, the present findings demonstrate that adoption serves as the causal pathway through which organizational readiness generates operational value. This provides a stronger theoretical explanation of how organizational readiness is translated into multidimensional performance outcomes such as accuracy, efficiency, speed, data management, and operational effectiveness (Mouakket & Aboelmaged, 2021; Almehairbi et al., 2022).

The mediation results are particularly important because they show that technology adoption explains the relationship between key environmental readiness factors and performance outcomes. Regulatory environment and external collaborations improved performance primarily through adoption success. This means that supportive regulation and collaborative networks do not automatically enhance laboratory performance by themselves; rather, they enhance performance when they enable forensic laboratories to adopt, integrate, and utilize advanced technologies effectively. This finding supports the TOE framework by showing that environmental conditions influence performance through the adoption process rather than only through direct effects (Nasrollahi & Ramezani, 2020; Duhamel et al., 2022). The findings of this study further demonstrate that forensic performance is inherently multidimensional and cannot be adequately represented through isolated operational indicators. Unlike conventional technology adoption studies that primarily emphasize efficiency, productivity, or user satisfaction, the present study conceptualized performance as a multidimensional construct comprising accuracy, speed, efficiency, data management, and operational effectiveness simultaneously. This multidimensional operationalization is particularly important within forensic environments because technological effectiveness influences not only operational productivity but also evidentiary integrity, judicial reliability, procedural accountability, and public trust.

The findings therefore extend existing performance literature by demonstrating that performance in forensic laboratories differs fundamentally from performance in conventional organizational settings. In many organizational technology adoption studies, performance is commonly assessed using narrow operational indicators such as workflow efficiency, cost reduction, or employee satisfaction. However, forensic laboratories operate within highly regulated and evidence-sensitive environments where performance outcomes carry legal and societal implications. For example, improvements in processing speed without maintaining analytical accuracy may compromise evidentiary reliability and judicial outcomes. Similarly, efficient digital systems that fail to maintain data integrity or chain-of-custody standards may undermine institutional credibility and public confidence. Consequently, forensic performance requires a broader and more integrated conceptualization than that commonly used in mainstream organizational technology adoption research (Hasani et al., 2023; Al Mansoori et al., 2018).

The findings of this study have important contextual implications because forensic laboratories operate under conditions that differ substantially from conventional organizational environments. Unlike commercial organizations, where technology adoption is often evaluated through productivity, profitability, cost reduction,

or customer satisfaction, forensic laboratories operate within highly regulated and evidence-sensitive settings where operational errors may directly affect criminal investigations and judicial outcomes. Therefore, technology adoption in forensic laboratories must be assessed not only in relation to efficiency, but also in terms of analytical accuracy, evidence integrity, procedural reliability, legal admissibility, data security, and public trust (Almehairbi et al., 2022; Ghaleb et al., 2021).

The findings suggest that organizational readiness for technology adoption in forensic laboratories requires stronger alignment among technological capability, regulatory compliance, human expertise, leadership support, and external collaboration than is typically required in less regulated sectors. Advanced technologies can improve forensic performance only when laboratories possess reliable infrastructure, skilled personnel, supportive management, clear governance structures, and regulatory approval for implementation. This supports the TOE framework's assumption that technology adoption is shaped by technological, organizational, and environmental conditions together rather than by technological availability alone (Nasrollahi & Ramezani, 2020; Mouakket & Aboelmaged, 2021).

LIMITATIONS AND FUTURE RESEARCH

Several limitations should be considered when interpreting the findings of this study. First, the research focuses exclusively on forensic laboratories in Abu Dhabi. Although this geographical focus provides an important context-specific understanding of the relationship between organisational readiness, technology adoption, and performance outcomes, it may limit the generalisability of the findings to forensic laboratories in other countries, regions, or institutional settings. Differences in regulatory frameworks, organisational structures, resource availability, technological maturity, and forensic practices may influence the relationships examined in this study. Consequently, the findings should be interpreted primarily within the Abu Dhabi context rather than assumed to be universally applicable.

Second, the study relies primarily on survey data collected from forensic laboratory personnel. While personnel are well positioned to provide insights into organisational readiness, technology adoption, and operational performance, self-reported data may be affected by subjective perceptions, response tendencies, or social desirability. Furthermore, collecting information on the predictor, mediator, and outcome variables from the same respondents and through the same survey instrument may create the potential for common method bias. Therefore, the reported relationships may not fully reflect objectively observed organisational and operational conditions.

Third, although technology adoption is conceptualised as a mediating variable, the study does not examine in sufficient detail the specific types of technologies adopted by forensic laboratories. Technologies such as artificial intelligence, digital forensics platforms, Laboratory Information Management Systems (LIMS), automated laboratory systems, advanced analytical instruments, and digital evidence-management solutions may differ substantially in their implementation requirements and operational effects. Treating technology adoption as a broad construct may therefore obscure differences in how individual technologies influence laboratory workflows, turnaround time, accuracy, productivity, quality assurance, resource utilisation, and case-processing capacity.

Finally, the study's cross-sectional design limits the extent to which changes in organisational readiness, technology adoption, and performance can be examined over time. While the findings can identify associations among these constructs, they provide limited evidence regarding the sequence through which readiness factors lead to technology adoption and subsequently contribute to improved performance. Longitudinal research would therefore be better positioned to establish temporal relationships and assess whether the benefits associated with technology adoption are sustained over time.

Future research should consider expanding the geographical scope beyond Abu Dhabi to include forensic laboratories across different regions and countries. A broader, cross-regional and cross-national research design would enable comparisons between laboratories operating under different regulatory environments, organisational structures, resource conditions, and levels of technological maturity. Such an approach would enhance the external validity and generalisability of the findings and help determine whether the relationships

between organisational readiness, technology adoption, and performance outcomes remain consistent across different forensic laboratory contexts.

Longitudinal research is also recommended to provide a deeper understanding of how organisational readiness and technology adoption develop over time. A longitudinal design could capture changes before, during, and after the implementation of new technologies and determine whether improvements in readiness and adoption translate into sustained performance benefits. This would provide stronger evidence regarding the temporal and potentially causal relationships among readiness factors, technology adoption, and forensic laboratory performance than can be obtained from a cross-sectional design.

Future studies should further examine specific categories of forensic technologies rather than treating technology adoption as a single, general construct. Technologies such as Laboratory Information Management Systems (LIMS), artificial intelligence, digital evidence management systems, automated analytical instruments, biometric technologies, and advanced forensic data-analysis platforms may generate different operational benefits and present different implementation requirements. Comparative studies could therefore assess which technologies provide the greatest improvements in areas such as turnaround time, accuracy, productivity, quality assurance, resource utilisation, and case-processing capacity.

Finally, future research could develop technology-specific models that identify the organisational, technological, and human factors required for successful implementation of particular forensic technologies. Such research would provide forensic laboratory managers and policymakers with more targeted evidence for prioritising technology investments and developing implementation strategies. Collectively, these research directions would extend the present study from examining whether technology adoption contributes to performance toward determining which technologies, under what organisational conditions, and over what period produce the greatest operational benefits.

CONCLUSION

The growing reliance on advanced forensic technologies requires forensic laboratories to develop strong organizational readiness capabilities. This study proposes a mediation framework in which technological infrastructure, human capital, organizational support, external collaborations, and the regulatory environment influence technology adoption, which subsequently improves organizational performance. By understanding these relationships, forensic laboratories in Abu Dhabi can better align their strategic investments, workforce development initiatives, and technological transformation programs to achieve superior forensic outcomes and operational excellence. This paper proposes that technology adoption mediates the relationship between readiness factors and performance outcomes in forensic laboratories in Abu Dhabi. By understanding this mediating mechanism, forensic organizations can develop more effective strategies for achieving technological transformation, operational excellence, and sustainable performance improvement..

Implications of The Research

This study offers several important theoretical implications for the literature on organizational readiness, technology adoption models, and forensic innovation. By empirically examining the mediating role of technology adoption in the relationship between organizational readiness factors and performance outcomes in Abu Dhabi forensic laboratories, the study extends existing theoretical frameworks into a highly regulated and institutionally embedded service context. The findings contribute to theory in three primary ways: strengthening the explanatory power of the Technology–Organization–Environment (TOE) framework, advancing organizational readiness perspectives through a forensic lens, and enriching forensic innovation scholarship by highlighting adoption as a key institutional performance mechanism. The study contributes to adoption theory by confirming the central mediating role of technology adoption as the mechanism linking readiness conditions to performance outcomes. While prior research has established that readiness influences adoption and that adoption improves organizational performance, fewer studies have empirically tested adoption as an intermediary pathway in forensic laboratory settings. The mediation results demonstrate that regulatory environment and external collaborations enhance performance primarily through adoption success. This finding strengthens theoretical understanding by positioning adoption not simply as an outcome variable but as a transformational

process through which readiness becomes operational effectiveness (Mouakket & Aboelmaged, 2021; Almehairbi et al., 2022). Nasrollahi and Ramezani (2020) similarly emphasized that readiness influences performance most effectively when adoption processes are activated, supporting the mediation logic confirmed in this study.

The findings of this study offer several important practical and policy implications for forensic decision-makers, laboratory managers, and government authorities in Abu Dhabi. As forensic laboratories play a critical role in supporting criminal investigations, judicial proceedings, and national security, enhancing technology adoption and organizational performance is a strategic priority for the Emirate. The results confirm that technology adoption serves as the key mechanism linking organizational readiness to performance outcomes, and that regulatory environment and external collaborations are the most influential determinants of adoption success and operational effectiveness. Accordingly, forensic modernization strategies in Abu Dhabi must prioritize regulatory facilitation, collaborative innovation ecosystems, and performance-driven adoption planning.

A primary practical implication is the need to strengthen regulatory frameworks that support the adoption of advanced forensic technologies. The study demonstrated that regulatory environment is the dominant driver of technology adoption and a significant predictor of performance outcomes. This indicates that adoption decisions in forensic laboratories are fundamentally compliance-driven, shaped by legal admissibility requirements, evidentiary integrity standards, and governance oversight structures. Policymakers should therefore develop clear regulatory guidelines that enable laboratories to integrate emerging technologies such as AI-assisted evidence interpretation tools, digital forensic platforms, and laboratory information management systems while maintaining procedural legitimacy and judicial acceptance. Regulatory clarity reduces uncertainty and creates institutional confidence, thereby accelerating adoption success (Nasrollahi & Ramezani, 2020; Ghaleb et al., 2021). Almutairi and Almesawa (2024) similarly emphasized that forensic evidence interpretation is deeply shaped by regulatory theories, reinforcing the importance of governance alignment in forensic innovation.

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