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Judicial Readiness for Artificial Intelligence Adoption in Bangladesh: An Analysis of Functional, Normative, and Ethical Drivers

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Abstract. Artificial intelligence (AI) is increasingly being introduced into judicial systems to improve administrative efficiency, information processing, and procedural consistency. This study empirically examines judicial readiness for AI adoption in Bangladesh across six dimensions: AI-assisted evidence analysis, sentencing, case management, transparency, accountability and rule-of-law compliance, investigation and inter-agency collaboration, and ethical concerns. Drawing on socio-legal and technological-governance perspectives, the study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) using cross-sectional survey data from 100 judicial officers representing different levels of Bangladesh's judiciary, supplemented by qualitative responses. The findings show statistically significant positive relationships between judicial readiness and AI-assisted case management ($\beta = 0.324$, $t = 3.320$, $p = 0.001$), transparency, accountability and rule-of-law compliance ($\beta = 0.238$, $t = 2.809$, $p = 0.005$), and ethical concerns ($\beta = 0.240$, $t = 3.405$, $p = 0.001$). By contrast, AI-assisted sentencing and investigation and inter-agency collaboration show positive but statistically non-significant relationships with readiness. Qualitative evidence indicates that judges generally perceive AI as a decision-support mechanism rather than a substitute for judicial judgment, particularly where its use may affect discretion, accountability, and procedural integrity. The study contributes to socio-legal scholarship by developing a function-specific and governance-sensitive account of judicial AI readiness, demonstrating that technological usefulness must be considered alongside ethical safeguards, transparency, accountability, and rule-of-law requirements. Practically, the findings support a phased approach to AI deployment that prioritises lower-risk administrative and analytical applications while preserving human oversight, judicial independence, and procedural fairness. The study is limited by its small voluntary sample, Bangladesh-specific context, cross-sectional design, and primary focus on judicial perspectives.

Keywords: Artificial Intelligence, Judiciary, Judicial Readiness, Case Management, Transparency, Ethics, Bangladesh, PLS-SEM

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1. INTRODUCTION

Artificial intelligence (AI) is increasingly being incorporated into judicial systems for case administration, evidence analysis, legal research, and, in some jurisdictions, sentencing support. The United States, China, and European Union member states have explored AI-enabled tools partly in response to increasing caseloads and demands for greater administrative efficiency [1], [2]. AI may improve case processing, information management, procedural consistency, and aspects of transparency [4], [3]. However, judicial AI adoption differs from technological adoption in ordinary administrative settings because judicial decision-making is constrained by independence, procedural fairness, accountability, reasoned judgment, and public confidence. Consequently, AI adoption cannot be assessed solely by technological capability or efficiency; it must also be evaluated in relation to judicial discretion, explainability, data protection, and the rule of law [5]. The central question is therefore whether the perceived functional benefits of AI are compatible with the normative and institutional requirements of justice.

This question is particularly important in developing judicial systems characterised by resource constraints, uneven digital infrastructure, and limited technological capacity. Bangladesh provides a relevant context. Its judiciary has undertaken digitalisation initiatives, including the Judicial Monitoring Dashboard (My Court App) and an online platform providing services such as an inheritance calculator, Judipay, e-filing, and e-certified copies [6]. Nevertheless, digital transformation remains constrained by inadequate infrastructure, institutional inertia, procedural conservatism, and technological limitations. These challenges are compounded by a substantial case backlog, reported to exceed four million cases, and wider concerns regarding institutional efficiency and political interference (Rahman, 2020). Importantly, digitalisation does not necessarily indicate readiness for AI adoption. AI introduces additional questions concerning institutional compatibility, judicial autonomy, accountability, and legal and ethical safeguards.

Judicial readiness should therefore be understood as a socio-institutional assessment of whether AI can support judicial functions without compromising core legal values. AI may offer benefits in evidence analysis, case management, investigation and inter-agency collaboration, sentencing, transparency, and procedural consistency. At the same time, its use may raise concerns regarding judicial discretion, procedural fairness, accountability, data protection, and rule-of-law compliance. Examining these competing considerations is particularly important because empirical evidence on judges' perceptions of AI adoption in developing jurisdictions remains limited. In Bangladesh, existing digitalisation initiatives demonstrate institutional interest in technological transformation but do not establish whether judicial officers are prepared to adopt AI-enabled systems. This study addresses this empirical gap by examining judicial officers' perceptions of AI adoption across six dimensions: AI in Evidence Analysis (EA), AI in Sentencing (Sentencing), AI in Case Management (CMD), Transparency, Accountability and Rule of Law (TAR), AI in Investigation and Inter-Agency Collaboration (INV&C), and Ethical Concerns (Ethical).

Drawing on a socio-legal perspective of technological governance, the study conceptualises judicial readiness as associated with both perceived functional benefits and ethical considerations. Rather than assuming that technological usefulness necessarily produces greater readiness, it empirically examines the relationships between these six

dimensions and judicial readiness for AI adoption. The study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) based on a cross-sectional survey of 100 judicial officers from different levels of Bangladesh's judiciary. This approach enables the study to translate the broader socio-legal question of judicial AI readiness into empirically testable relationships while retaining attention to institutional and normative considerations.

The study makes three contributions. First, it provides empirical evidence on judicial officers' perceptions of AI adoption in an emerging-country judicial system, addressing a significant contextual gap in existing research. Second, it contributes to socio-legal scholarship by demonstrating that judicial AI adoption should be examined not only through technological utility but also through institutional, ethical, and rule-of-law considerations. Third, it develops an empirically testable model linking distinct AI applications and governance-related considerations to judicial readiness. The findings contribute to Bangladesh's judicial modernisation efforts and to broader debates concerning the conditions under which AI can be incorporated into judicial systems while preserving judicial independence, procedural integrity, accountability, and the rule of law.

2. CONCEPTUAL FRAMEWORK

This study conceptualises judicial readiness for AI adoption as a socio-legal and institutional outcome shaped by both the perceived functionality of AI and its compatibility with the normative requirements of judicial governance. Drawing on technological governance and the digital rule of law [5], [3], [7], the framework moves beyond a purely technology-centred understanding of adoption. In judicial institutions, the utility of AI is conditioned by requirements of judicial independence, procedural fairness, accountability, transparency, and the rule of law. Judicial readiness therefore reflects the perceived functional appropriateness and institutional legitimacy of incorporating AI into judicial processes.

The framework comprises six constructs associated with judicial readiness: AI in Evidence Analysis (EA), AI in Sentencing (Sentencing), AI in Case Management (CMD), Transparency, Accountability and Rule of Law (TAR), AI in Investigation and Inter-Agency Collaboration (INV&C), and Ethical Concerns (Ethical**)**. EA, Sentencing, CMD, and INV&C represent distinct functional domains of AI application, enabling the study to examine whether readiness varies according to the nature and sensitivity of the judicial function involved. TAR and Ethical represent normative and governance dimensions, capturing the conditions through which the legality, legitimacy, accountability, and ethical acceptability of AI use may be evaluated.

The framework therefore posits that judicial readiness is not a uniform response to technological innovation. It is associated with both functional utility and normative compatibility. AI may be perceived more favourably where it supports judicial or administrative functions without displacing human responsibility or judicial discretion. Conversely, applications involving greater adjudicative or institutional sensitivity may generate greater caution. At the same time, transparency, accountability, rule-of-law compliance, and ethical safeguards may shape the legitimacy and acceptability of AI by providing conditions for human oversight and institutional accountability.

Accordingly, the conceptual framework provides the basis for the study's structural model and hypothesis development. It does not presume that functional benefits necessarily increase readiness or that ethical considerations necessarily constrain adoption. Instead, the six

constructs are treated as empirically testable predictors of judicial readiness for AI adoption**.** The framework thus advances the central proposition that judicial AI adoption is function-specific and governance-sensitive: readiness depends not only on what AI can do, but also on the judicial function to which it is applied and whether its use is perceived as compatible with the institutional and normative foundations of judicial decision-making. Figure 1 presents the hypothesised relationships between the six constructs and judicial readiness for AI adoption.

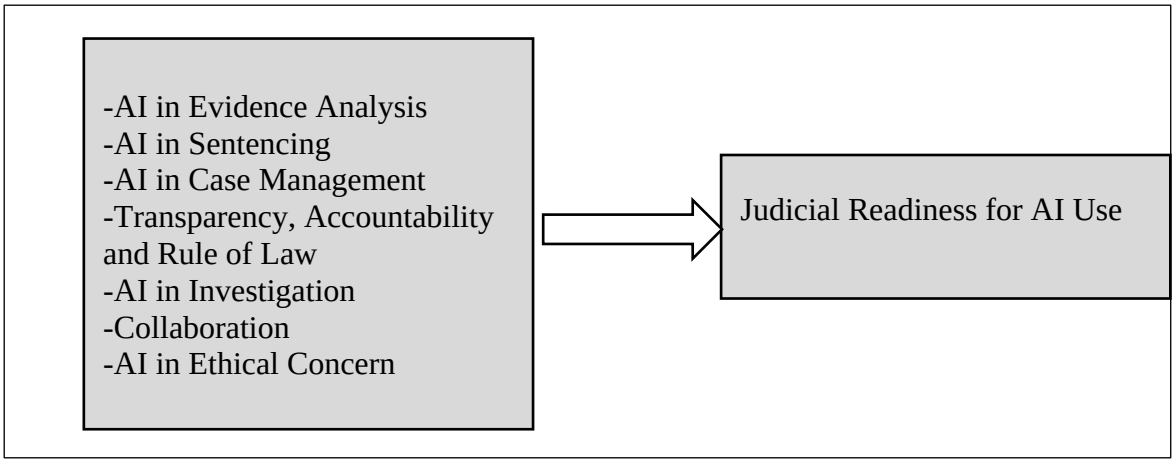


Figure 1: Conceptual Framework of the Research

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The literature on AI in judicial systems indicates that its adoption involves both functional and normative considerations. AI may enhance administrative and analytical functions such as case management, evidence processing, and decision support, but its use in courts is constrained by requirements of judicial independence, procedural fairness, accountability, transparency, explainability, and rule-of-law compliance [4], [3], [5]. Judicial AI adoption should therefore be understood as a socio-institutional process, in which perceived technological utility is evaluated alongside institutional compatibility and normative legitimacy. This perspective is particularly relevant to Bangladesh, where judicial digitalisation is progressing alongside persistent institutional and infrastructural constraints. Existing initiatives, including the e-Judiciary Programme and digital case-filing systems, indicate increasing technological engagement but do not establish readiness for AI-enabled judicial processes. Readiness depends on how judicial officers assess the utility, reliability, institutional appropriateness, and normative implications of particular AI applications. Accordingly, this study treats judicial readiness as a multidimensional construct reflecting the perceived compatibility of AI with both judicial functions and the institutional values governing their exercise.

On this basis, the following sections develop six hypotheses linking specific AI applications and governance-related considerations to judicial readiness. The hypotheses are grounded in the proposition that AI adoption in judicial institutions is function-specific and governance-sensitive: the relationship between an AI application and readiness depends not

only on its perceived functional value, but also on the extent to which its use is compatible with judicial discretion, institutional accountability, procedural integrity, and the rule of law.

3.1 Global Integration of AI in Judicial Processes

The integration of artificial intelligence (AI) into judicial systems reflects a shift from conventional digitalisation towards algorithm-supported administrative and decision-support processes. AI applications range from case scheduling, docket management, and information processing to evidence analysis and sentencing support. Although such applications may enhance efficiency, consistency, and analytical capacity, their institutional legitimacy depends on the conditions governing their use, including human oversight, transparency, explainability, accountability, and compliance with legal norms [5], [7].

Comparative experience further indicates that judicial AI adoption is context-dependent rather than technologically determined. Its scope and acceptability are shaped by legal traditions, institutional capacity, procedural safeguards, technological infrastructure, and governance arrangements. AI is more readily compatible with judicial functions where it operates as a support mechanism rather than a substitute for judicial judgment. This distinction is particularly important in functions involving significant discretion or legal consequences, where concerns regarding accountability, explainability, and judicial autonomy may constrain acceptance. Judicial readiness should therefore be understood in terms of both the perceived utility of AI and its compatibility with the institutional and normative requirements of adjudication. Within this analytical framework, the present study examines six dimensions of judicial AI adoption: AI in Evidence Analysis (EA), AI in Sentencing (Sentencing), AI in Case Management (CMD), Transparency, Accountability and Rule of Law (TAR), AI in Investigation and Inter-Agency Collaboration (INV&C), and Ethical Concerns (Ethical). These dimensions represent distinct functional and governance-related considerations through which judicial officers may evaluate the appropriateness of AI adoption. The following subsections develop the theoretical and empirical rationale for each hypothesised relationship with judicial readiness for AI adoption.

3.1.1 AI in Evidence Analysis and Judicial Readiness

AI-assisted evidence analysis represents a relatively suitable domain for judicial AI adoption because it can support the organisation, retrieval, classification, and analysis of large volumes of documentary, digital, and forensic evidence. Its principal value lies in improving information-processing efficiency and analytical capacity rather than replacing judicial evaluation [4], [3]. However, evidentiary assessment remains a judicial responsibility. Questions of relevance, admissibility, reliability, and probative value require legal judgment and cannot be delegated solely to algorithmic systems. Accordingly, judicial acceptance of AI-assisted evidence analysis is likely to depend on whether AI operates as a decision-support tool subject to human oversight, with appropriate safeguards concerning accuracy, bias, transparency, and explainability [5], [7]. This consideration is particularly relevant in Bangladesh, where increasing volumes of digital records and documentary materials may create substantial information-processing demands for courts. AI could assist judicial officers in managing and reviewing such materials while preserving human responsibility for evidentiary decisions. Thus, perceived functional benefits may enhance judicial readiness where AI improves analytical efficiency without displacing judicial discretion. Accordingly, the study hypothesises:

H1: Perceptions of AI-assisted evidence analysis are positively associated with judicial readiness for AI adoption.

3.1.2 AI in Sentencing and Judicial Readiness

AI-assisted sentencing represents a more normatively sensitive application because sentencing directly engages judicial discretion, proportionality, equality, and procedural fairness. Unlike administrative applications, sentencing technologies may affect substantive judicial outcomes. AI may nevertheless provide decision-support functions, such as organising case information, identifying relevant factors, and supporting consistency, while leaving the final decision to the judge [5], [8]. The potential value of AI in sentencing therefore depends on whether its functional benefits are compatible with judicial independence and individualised decision-making. Judges may be more receptive where AI supports consistency and efficiency without constraining discretion. Conversely, concerns about algorithmic bias, opacity, or excessive reliance on automated recommendations may reduce judicial readiness. The relationship is therefore expected to depend on whether AI is perceived as a support mechanism rather than a substitute for judicial judgment. This consideration is particularly relevant to Bangladesh, where any use of AI in sentencing would need to reconcile potential consistency and efficiency gains with established requirements of judicial reasoning and discretion. Accordingly, the study hypothesises:

H2: Perceptions of AI-assisted sentencing are positively associated with judicial readiness for AI adoption.

3.1.3 AI in Case Management and Judicial Readiness

AI-assisted case management represents a comparatively less normatively sensitive application because it primarily supports the administrative organisation of judicial proceedings. AI-enabled systems can assist with scheduling, docket management, workflow monitoring, document organisation, and identification of procedural delays. By reducing repetitive administrative tasks, such systems may improve workflow efficiency and allow judicial officers to devote greater attention to adjudicative functions. The theoretical basis for this relationship lies in the distinction between administrative support and substantive adjudication. Because case-management applications can enhance organisational efficiency without directly transferring judicial decision-making authority to algorithms, they may be perceived as more compatible with judicial independence. Experiences from jurisdictions including China, India, and Singapore suggest that digital and AI-supported case-management systems can improve case processing and administrative coordination [9], [10]. This relationship is particularly relevant to Bangladesh, where substantial case backlogs create continuing pressure for more efficient judicial administration. Where judicial officers perceive AI-assisted case management as capable of reducing administrative burdens while preserving adjudicative authority, greater readiness for AI adoption may follow. Accordingly, this study hypothesises:

H3: Perceptions of AI-assisted case management are positively associated with judicial readiness for AI adoption.

3.1.4 Transparency, Accountability, and Rule of Law and Judicial Readiness

The legitimacy of AI in judicial processes depends not only on its functional capabilities but also on the governance conditions under which it operates. Transparency, accountability, explainability, and rule-of-law compliance are therefore central to institutional acceptance. Opaque AI systems may make it difficult to scrutinise outputs, identify responsibility for errors, or challenge potentially biased outcomes, thereby undermining confidence in AI-assisted judicial processes. Existing literature emphasises the importance of human oversight, explainability, and institutional accountability in AI-supported justice systems. Experiences in jurisdictions such as China and Estonia illustrate the need for mechanisms through which algorithmic processes can remain subject to institutional scrutiny [5]. Similarly, AI governance scholarship highlights the protection of due process, prevention of discriminatory outcomes, and transparency as conditions for the legitimate use of algorithmic systems in legal decision-making [11]. The theoretical expectation is that judicial officers who perceive AI systems as transparent, accountable, explainable, and consistent with rule-of-law requirements will be more likely to regard their adoption as institutionally legitimate and appropriate. This relationship is particularly relevant in Bangladesh, where AI adoption must remain compatible with judicial accountability, procedural fairness, and the lawful exercise of judicial authority. Accordingly, the following hypothesis is adopted.

H4: Perceptions of transparency, accountability, and rule-of-law compliance in AI systems are positively associated with judicial readiness for AI adoption.

3.1.5 AI in Investigation and Inter-Agency Collaboration and Judicial Readiness

AI-assisted investigation and inter-agency collaboration may support judicial processes by facilitating information sharing, evidence verification, case tracking, and coordination among courts, law-enforcement agencies, investigative bodies, and other public institutions. By reducing information fragmentation and communication delays, such systems may improve institutional coordination and the efficiency of judicial processes. The theoretical basis for this relationship lies in institutional interoperability. Judicial processes often depend on information generated and maintained outside the courts; technologies that enable reliable information exchange may therefore reduce duplication and improve continuity across institutional boundaries. Experiences reported in China and India indicate the potential of digital and AI-enabled systems to support information sharing, case tracking, and evidence-related coordination [9], [12]. However, greater technological integration across institutions may also raise concerns regarding data protection, accountability, and the institutional boundaries between judicial and investigative functions. Judicial readiness is therefore expected to be greater where AI-assisted collaboration is perceived to improve coordination while preserving judicial independence and procedural safeguards. This consideration is particularly relevant in Bangladesh, where judicial processes involve coordination among multiple public institutions. Accordingly, this study hypothesises :

H5: Perceptions of AI-assisted investigation and inter-agency collaboration are positively associated with judicial readiness for AI adoption.

3.1.6 Ethical Considerations and Judicial Readiness

Ethical considerations are a distinct dimension of judicial AI adoption because its legitimacy depends not only on technical performance but also on compatibility with fairness,

accountability, privacy, transparency, human oversight, and judicial independence. These considerations are particularly important where AI may influence evidence assessment, sentencing, or other processes affecting individual rights. Ethical safeguards may influence judicial readiness by shaping perceptions of whether AI is legitimate, trustworthy, and institutionally appropriate. Measures addressing bias, data protection, accountability, transparency, and human oversight may increase confidence that AI can support judicial functions without undermining core judicial values [13]. Conversely, perceived weaknesses in these safeguards may reduce willingness to adopt AI. Ethical considerations therefore function not merely as constraints on technological adoption but as conditions through which the legitimacy of judicial AI is assessed. This relationship is particularly relevant in Bangladesh, where governance arrangements for judicial AI remain at an emerging stage. Judicial officers' perceptions of ethical requirements may therefore be associated with their readiness to adopt AI, particularly where AI is understood as a decision-support mechanism that complements rather than replaces judicial judgment. Accordingly, this study adopts the last hypothesis:

H6: Perceptions of ethical considerations are positively associated with judicial readiness for AI adoption.

3.2 Synthesis of the Hypotheses

The literature indicates that judicial readiness for AI adoption is associated with both perceived functional utility and institutional-normative compatibility. AI-assisted evidence analysis, sentencing, case management, and investigation and inter-agency collaboration represent distinct functional domains through which judicial officers may evaluate the potential utility of AI. These considerations provide the basis for H1, H2, H3, and H5, respectively. H4 addresses the governance dimension by examining whether perceptions of transparency, accountability, and rule-of-law compliance are associated with greater judicial readiness. H6 addresses the ethical dimension of AI adoption. Rather than treating ethical considerations solely as constraints on technological use, the study examines whether perceptions of ethical safeguards are associated with judicial readiness. This reflects the proposition that confidence in safeguards relating to fairness, accountability, transparency, bias mitigation, data protection, and human oversight may contribute to the perceived legitimacy of AI adoption. Taken together, the six hypotheses operationalise the study's central proposition that judicial AI readiness is function-specific and governance-sensitive. The framework does not assume that technological utility alone determines readiness; rather, it examines whether functional applications and governance-related considerations are statistically associated with preparedness for AI adoption. The subsequent PLS-SEM analysis tests these hypothesised relationships and assesses their relative contributions to judicial readiness within the Bangladeshi judiciary.

METHODOLOGY

This study employs a quantitative, cross-sectional survey design to examine the factors associated with judicial readiness for artificial intelligence (AI) adoption in Bangladesh. The empirical model operationalises six hypothesised predictors: AI in Evidence Analysis (EA), AI in Sentencing (Sentencing), AI in Case Management (CMD), Transparency, Accountability and Rule of Law (TAR), AI in Investigation and Inter-Agency Collaboration (INV&C), and

Ethical Concerns (Ethical**)**. These constructs correspond directly to H1–H6 and are examined as predictors of judicial readiness for AI adoption. A quantitative design was adopted because the study seeks to operationalise judicial perceptions as latent constructs measured through multiple indicators and to test the hypothesised associations among these constructs. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to estimate the measurement and structural models simultaneously. The method is appropriate for the study because it accommodates multiple latent constructs, a comparatively modest sample, and a model combining function-specific and governance-related predictors. The analysis therefore provides an empirical means of testing the study's central proposition that judicial readiness for AI adoption is function-specific and governance-sensitive.

4.1 Population, Sampling and Participants

The target population comprised approximately 1,600 judicial officers serving in Bangladesh's subordinate and superior courts. Following formal communication with the Judicial Administration Training Institute (JATI) and subsequent follow-up, 100 judicial officers voluntarily participated, representing an estimated response rate of 6.25%. A stratified purposive sampling strategy was employed to obtain variation across court level, jurisdiction, and judicial experience. Purposive selection reflected the voluntary nature of participation and the practical constraints on obtaining random access to judicial officers, while stratification sought to ensure representation across different judicial settings, including district courts and metropolitan magistrates' courts. The sample size was assessed in relation to the requirements of PLS-SEM. Although PLS-SEM can accommodate relatively modest samples in models involving multiple latent constructs, sample size remains relevant to the precision and generalisability of findings. Accordingly, the study does not claim statistical representativeness of Bangladesh's judiciary. Rather, the 100 responses provide empirical evidence of judicial officers' perceptions within the participating sample and support exploratory assessment of the hypothesised relationships. Potential non-response bias was examined through comparisons between early and late respondents and assessment of respondents' demographic and professional characteristics for substantial imbalances. These procedures provided an additional check on whether systematic differences among participants might affect interpretation of the results.

4.2 Instrument Development and Operationalisation

The survey instrument was developed from literature on AI adoption in judicial and legal contexts and adapted to the institutional context of Bangladesh. Item development was informed by relevant scholarship, including Remus and Levy [14], Sourdin [3], and Sun and Xiao [7], together with relevant policy and governance guidance from the European Commission (2021). This process sought to ensure conceptual alignment with established dimensions of judicial AI functionality, governance, and ethical safeguards while maintaining contextual relevance.

The questionnaire comprised three components. The first collected demographic and professional information, including judicial rank, years of judicial experience, and prior exposure to digital court-management systems. The second comprised 30 measurement items organised into six latent constructs:

1. B1 – AI in Evidence Analysis (EA): perceptions of AI use for analysing digital evidence, documents, and forensic information.

2. B2 – AI in Sentencing (Sentencing): perceptions of AI-assisted sentencing processes, including sentencing support and consistency.
3. B3 – AI in Case Management (CMD): perceptions of AI-supported scheduling, workflow management, backlog reduction, and procedural automation.
4. B4 – Transparency, Accountability, and Rule of Law (TAR): perceptions of transparency, explainability, accountability, judicial scrutiny, and compliance with legal and rule-of-law requirements.
5. B5 – AI in Investigation and Inter-Agency Collaboration (INV&C): perceptions of AI-enabled information sharing, investigation, coordination, and collaboration among relevant institutions.
6. B6 – Ethical Concerns (Ethical): perceptions concerning bias, data protection, human oversight, human dignity, and ethical safeguards.

All 30 measurement items employed a five-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. This specification resolves the earlier inconsistency in the manuscript concerning the number of response categories.

The third component contained open-ended questions addressing institutional constraints, ethical concerns, training requirements, and the practical feasibility of AI adoption. These responses provided supplementary contextual evidence but were not included in the PLS-SEM estimation. The instrument therefore operationalised the study's socio-legal framework by measuring six dimensions of judicial AI adoption and governance **(**B1–B6) and examining their hypothesised associations with judicial readiness for AI adoption. This operationalisation allows AI adoption to be examined as an institutional and normative issue rather than solely as a question of technological efficiency.

4.3 Data Collection and Data Screening

Data were collected over six weeks in November–December 2025 using an online questionnaire distributed through formal institutional correspondence. Participation was voluntary, and respondents were informed of the study's purpose before completing the questionnaire. The responses were initially coded and screened in SPSS. Data screening included checks for completeness, missing values, consistency, descriptive characteristics, and distributional properties. Responses that were incomplete or otherwise unsuitable for analysis were excluded before the final dataset was transferred to SmartPLS 4. The resulting analytical sample comprised 100 judicial officers.

4.4 PLS-SEM Analytical Procedure

The hypotheses were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4. The analysis proceeded in two stages: measurement model assessment and structural model assessment. PLS-SEM was selected because the study examines multiple latent constructs measured through multiple indicators and estimates their hypothesised relationships with judicial readiness within a comparatively modest sample. Statistical inference was based on 5,000 bootstrap resamples, which were used to generate empirical sampling distributions for the estimated path coefficients and assess their statistical significance.

4.5 Measurement Model Assessment

The measurement model was assessed to establish the reliability and validity of the latent constructs before testing the structural relationships. The assessment examined indicator loadings, internal consistency reliability, convergent validity, and discriminant validity.

4.5.1 Internal Consistency Reliability

Internal consistency reliability was assessed using Cronbach's alpha (α) and composite reliability (CR). Values of 0.70 or above were considered indicative of acceptable reliability.

4.5.2 Convergent Validity

Convergent validity was assessed using outer loadings and the Average Variance Extracted (AVE). An AVE value of 0.50 or above was adopted as the criterion for satisfactory convergent validity. Indicator loadings were examined alongside the construct-level reliability and validity measures. Decisions regarding indicator retention were based on both statistical performance and theoretical relevance. Thus, indicators were not removed solely because of relatively lower loadings where their retention remained substantively important and did not compromise the overall reliability or convergent validity of the construct.

4.5.3 Discriminant Validity

Discriminant validity was assessed using the Heterotrait–Monotrait ratio (HTMT). An HTMT value below 0.85 was adopted as the conservative criterion for establishing discriminant validity. This assessment was particularly important because several constructs represent conceptually related dimensions of judicial AI adoption. Demonstrating discriminant validity ensures that function-specific AI applications, governance considerations, and ethical considerations remain empirically distinguishable within the model. Taken together, the assessment of outer loadings, Cronbach's alpha, composite reliability, AVE, and HTMT established the adequacy of the measurement model for subsequent structural analysis.

4.6 Structural Model Evaluation

Following validation of the measurement model, the structural model was assessed to test H1–H6. The analysis examined path coefficients (β), t-statistics, p-values, and bootstrapped confidence intervals to evaluate the direction, magnitude, and statistical significance of the hypothesised relationships. The explanatory power of judicial readiness was assessed using the coefficient of determination (R^2). The effect size (f^2)was examined to determine the substantive contribution of individual predictor constructs to the explained variance in judicial readiness. Predictive relevance (Q^2) was also assessed using the appropriate PLS-SEM procedure. The structural model specified six direct relationships between the dimensions identified in the conceptual framework and judicial readiness for AI adoption. These comprised AI in Evidence Analysis (B1), AI in Sentencing (B2), AI in Case Management (B3), Transparency, Accountability and Rule of Law (B4), AI in Investigation and Inter-Agency Collaboration (B5), and Ethical Concerns (B6).

Importantly, B6 was modelled as a direct predictor rather than a moderator. This specification corresponds to H6, which proposes that perceptions of ethical considerations are

positively associated with judicial readiness. Accordingly, a positive and statistically significant coefficient for B6 was interpreted as evidence that stronger recognition of the ethical dimensions of AI adoption was associated with greater judicial readiness, subject to the substantive meaning of the underlying measurement items. The structural model was therefore evaluated across three dimensions: (i) the direction and statistical significance of the hypothesised relationships, (ii) the explanatory power of the model, and (iii) the substantive contribution of individual predictors**.** This provides an empirical basis for assessing the relative contribution of functional, governance, and ethical dimensions to judicial readiness for AI adoption.

EMPIRICAL ANALYSIS

The empirical analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the hypothesised relationships between six latent constructs and judicial readiness for AI adoption. The analysis comprised assessment of the reflective measurement model and evaluation of the structural model. The predictor constructs were AI in Evidence Analysis (EA), AI in Sentencing (Sentencing), AI in Case Management and Disposal of Non-Cognizable Offences (CMD), Transparency, Accountability and Rule of Law (TAR), AI in Investigation and Inter-Agency Collaboration (INV&C), and Ethical Concerns (Ethical). Judicial Readiness was specified as the endogenous construct. Consistent with the revised conceptual framework, all six constructs were modelled as direct predictors of judicial readiness, including Ethical. The analysis used SmartPLS 4, with bootstrapping based on 5,000 resamples for statistical inference.

5.1 Demographic Profile of the Respondents

One hundred judicial officers took part in this study. The composition of the judiciary was mirrored in the gender distribution, which was 80.3% male (n = 80), 18.2% female (n = 18), and 1.5% (n = 2) "prefer not to say." The age distribution showed that the majority were in the mid-career range: 63.6% were between the ages of 35 and 45, 25.8% were under 35, 7.6% were between the ages of 46 and 55, and 1.5% were over the age of 56. In terms of professional readiness, 19.7% (n = 15) had some training in legal technology or artificial intelligence, but 80.3% (n = 85) had no formal training. Digital court systems, such as e-filing, virtual hearings, and digital case management platforms, were at least somewhat familiar to all of the respondents. The magnitude of the judicial workload varied greatly among jurisdictions, with pending cases ranging from 170 to 11,000 and annual case disposals from 100 to 4,000. Table 1 presents the demographic data of the judges.

Table 1: Demographic Data of the Judges in Bangladesh

Category	Sub-category	Frequency (n)	Percentage (%)
Gender	Male	80	80.3%
	Female	18	18.2%

Category	Sub-category	Frequency (n)	Percentage (%)
	Prefer not to say	2	1.5%
Age Group	35	26	25.8%
	35–45	64	63.6%
	46–55	8	7.6%
	56+	2	1.5%
Training in AI / Legal Technology	Yes	15	15.2%
	No	85	84.8%
Case Load (Pending)	Lowest pending cases	—	170 cases
	Highest pending cases	—	11,000 cases
	Typical range (majority of respondents)	—	800–3,200 cases

5.2 Reflective Measurement Model Results—Reliability and Validity

The reflective measurement model was assessed using outer loadings, Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and discriminant-validity tests. An outer loading of approximately 0.70 or above was treated as a preferred indicator of satisfactory item reliability [15]. However, indicators with lower loadings were not removed automatically; their retention was considered in conjunction with construct reliability, convergent validity, and theoretical relevance. Table 2 presents the outer loadings of the measurement model.

Table 2. Outer loadings of the measurement model

Indicators	Variables	Outer Loadings
	AI in Evidence Analysis	
E A1		0.759
E A1		0.792
E A1		0.831
E A1		0.798
	AI in Sentencing	
Sentencing 1		0.751
Sentencing 2		0.735
Sentencing 3		0.526
Sentencing 4		0.582
	AI in Case Management and Disposal of Non-Cognizable Offences	
CMD 1		0.893
CMD 1		0.816
CMD 1		0.875
CMD 1		0.914
	Transparency, Accountability, and Rule of Law	

T R A 1	0.870
T R A 2	0.839
T R A 3	0.798
T R A 4	0.838
AI in Investigation and Inter-Agency Collaboration	
Inv & C 1	0.847
Inv & C 1	0.863
Inv & C 1	0.824
Inv & C 1	0.698
Ethical Concerns and Readiness	
Ethical 1	0.786
Ethical 1	0.909
Ethical 1	0.799
Judicial Readiness	
Judicial Readiness 1	0.776
Judicial Readiness 2	0.724
Judicial Readiness 3	0.665
Judicial Readiness 4	0.529
Judicial Readiness 5	0.795
Judicial Readiness 6	0.797
Judicial Readiness 7	0.649

The results show that most indicators achieved satisfactory outer loadings. Several indicators, however, recorded loadings below 0.70, particularly within SENT, INV&C, and Judicial Readiness. These indicators were retained where the corresponding constructs demonstrated acceptable overall reliability and convergent validity and where the indicators remained substantively relevant to the construct definitions. Thus, indicator retention was based on both statistical and theoretical considerations rather than on an automatic loading threshold.

5.2.1 Construct Reliability and Convergent Validity

Internal consistency and convergent validity were assessed using Cronbach's alpha, composite reliability, and AVE. As shown in Table 3, all constructs achieved Cronbach's alpha and composite reliability values above 0.70, while AVE values were **0.50 or higher**. These results provide evidence of acceptable internal consistency and convergent validity across the measurement model.

Table 3. Construct reliability and validity

Indicators	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)

CMD	0.898	0.901	0.929	0.766
E A	0.807	0.811	0.873	0.633
Ethical	0.784	0.859	0.872	0.694
Inv & C	0.823	0.825	0.884	0.657
Readiness	0.833	0.843	0.876	0.505
Sentencing	0.767	0.703	0.747	0.500
T A R	0.857	0.860	0.903	0.700

The Sentencing construct warrants particular attention because two of its indicators have relatively low outer loadings. Nevertheless, its Cronbach's alpha (0.767), composite reliability (0.747), and AVE (0.500) meet the adopted minimum criteria. Accordingly, the construct was retained for structural analysis. Discriminant validity was further examined using the Fornell-Larcker criterion, as presented in Table 4.

Table 4. Discriminant Validity: Employing the Fornell-Larcker criterion

Indicators	CMD	E A	Ethical	Inv & C	Readiness	Sentencing	T A R
CMD	0.875						
E A	0.486	0.795					
Ethical	0.478	0.151	0.833				
Inv & C	0.725	0.566	0.388	0.810			
Readiness	0.808	0.587	0.550	0.728	0.711		
Sentencing	0.727	0.552	0.367	0.527	0.694	0.656	
T A R	0.588	0.661	0.190	0.641	0.685	0.535	0.836

Table 5. Cross-loadings

Indicators	CMD	E A	Ethical	Inv & C	Readiness	Sentencing	T A R
CMD 1	0.893	0.345	0.433	0.599	0.733	0.668	0.485
CMD 2	0.816	0.496	0.325	0.612	0.648	0.524	0.531
CMD 3	0.875	0.421	0.429	0.667	0.722	0.651	0.538
CMD 4	0.914	0.448	0.478	0.663	0.721	0.693	0.508
E A 1	0.322	0.759	0.025	0.433	0.449	0.418	0.544
E A 2	0.367	0.792	0.057	0.308	0.434	0.336	0.449
E A 3	0.416	0.831	0.180	0.516	0.436	0.480	0.534
E A 4	0.431	0.798	0.201	0.524	0.533	0.507	0.565
Ethical 2	0.364	-0.019	0.786	0.220	0.374	0.159	0.000
Ethical 1	0.531	0.222	0.909	0.464	0.585	0.417	0.278
Ethical 3	0.239	0.124	0.799	0.218	0.362	0.291	0.136
Inv & C 1	0.654	0.431	0.299	0.847	0.575	0.441	0.559
Inv & C 2	0.538	0.608	0.262	0.863	0.637	0.497	0.597
Inv & C 3	0.502	0.531	0.194	0.824	0.513	0.343	0.555
Inv & C 4	0.641	0.260	0.479	0.698	0.610	0.405	0.364
Readiness 1	0.664	0.431	0.614	0.562	0.776	0.650	0.497
Readiness 2	0.485	0.487	0.420	0.446	0.724	0.490	0.553
Readiness 3	0.634	0.361	0.390	0.564	0.665	0.368	0.440
Readiness 4	0.479	0.323	0.198	0.398	0.529	0.258	0.415
Readiness 5	0.520	0.404	0.388	0.493	0.795	0.491	0.441

Readiness 6	0.613	0.488	0.458	0.556	0.797	0.587	0.481
Readiness 7	0.598	0.403	0.186	0.575	0.649	0.523	0.574
Sentencing 1	0.532	0.661	0.183	0.489	0.575	0.751	0.633
Sentencing 2	0.575	0.215	0.507	0.331	0.550	0.735	0.261
Sentencing 3	0.424	0.147	0.116	0.237	0.292	0.526	0.062
Sentencing 4	0.335	0.340	0.029	0.269	0.299	0.582	0.323
T A R 1	0.524	0.526	0.151	0.507	0.566	0.464	0.870
T A R 2	0.470	0.592	0.074	0.489	0.500	0.492	0.839
T A R 3	0.473	0.487	0.222	0.495	0.589	0.360	0.798
T A R 4	0.497	0.606	0.175	0.637	0.622	0.477	0.838

The cross-loading results in Table 5 further indicate that each indicator loads most strongly on its intended construct. Although some indicators show meaningful secondary loadings, the primary loading remains higher than the corresponding cross-loadings, providing additional evidence of construct distinctiveness. Finally, HTMT was used as the principal assessment of discriminant validity because it provides a more sensitive test of construct distinctiveness [16]. As shown in Table 6, all HTMT values are below the 0.85 criterion adopted in the methodology. The results therefore provide no evidence of problematic discriminant validity among the constructs.

Table 6. Heterotrait–Monotrait ratio (HTMT)

Indicators	CMD	E A	Ethical	Inv & C	Readiness	Sentencing	T A R
CMD							
E A	0.571						
Ethical	0.537	0.222					
Inv & C	0.641	0.687	0.441				
Readiness	0.734	0.709	0.636	0.672			
Sentencing	0.788	0.756	0.511	0.728	0.724		
T A R	0.671	0.791	0.227	0.758	0.809	0.699	

5.3 Assessment of the Structural Model Results

Following validation of the measurement model, the structural model was assessed to test H1–H6. Multicollinearity was first examined using the inner variance inflation factor (VIF). The VIF values ranged from 1.359 to 3.526, remaining below the commonly applied threshold of 5.0. These results indicate that multicollinearity was not a substantial concern. Hypothesis testing was conducted using bootstrapping with 5,000 resamples. The results indicate that CMD, ETH, and TAR were positively and statistically significantly associated with judicial readiness, whereas EA, INV&C, and SENT did not demonstrate statistically significant relationships.

Specifically, CMD had the strongest significant relationship with judicial readiness **(**β = 0.324, t = 3.320, p = 0.001), followed by ETH (β = 0.240, t = 3.405, p = 0.001**)** and TAR **(**β = 0.238, t = 2.809, p = 0.005). In contrast, the relationships for EA (β = 0.096, p = 0.328), INV&C (β = 0.128, p = 0.172), and Sentencing (β = 0.123, p = 0.163) were not statistically significant. Figure 2 presents the structural model of judges' perceptions of AI use.

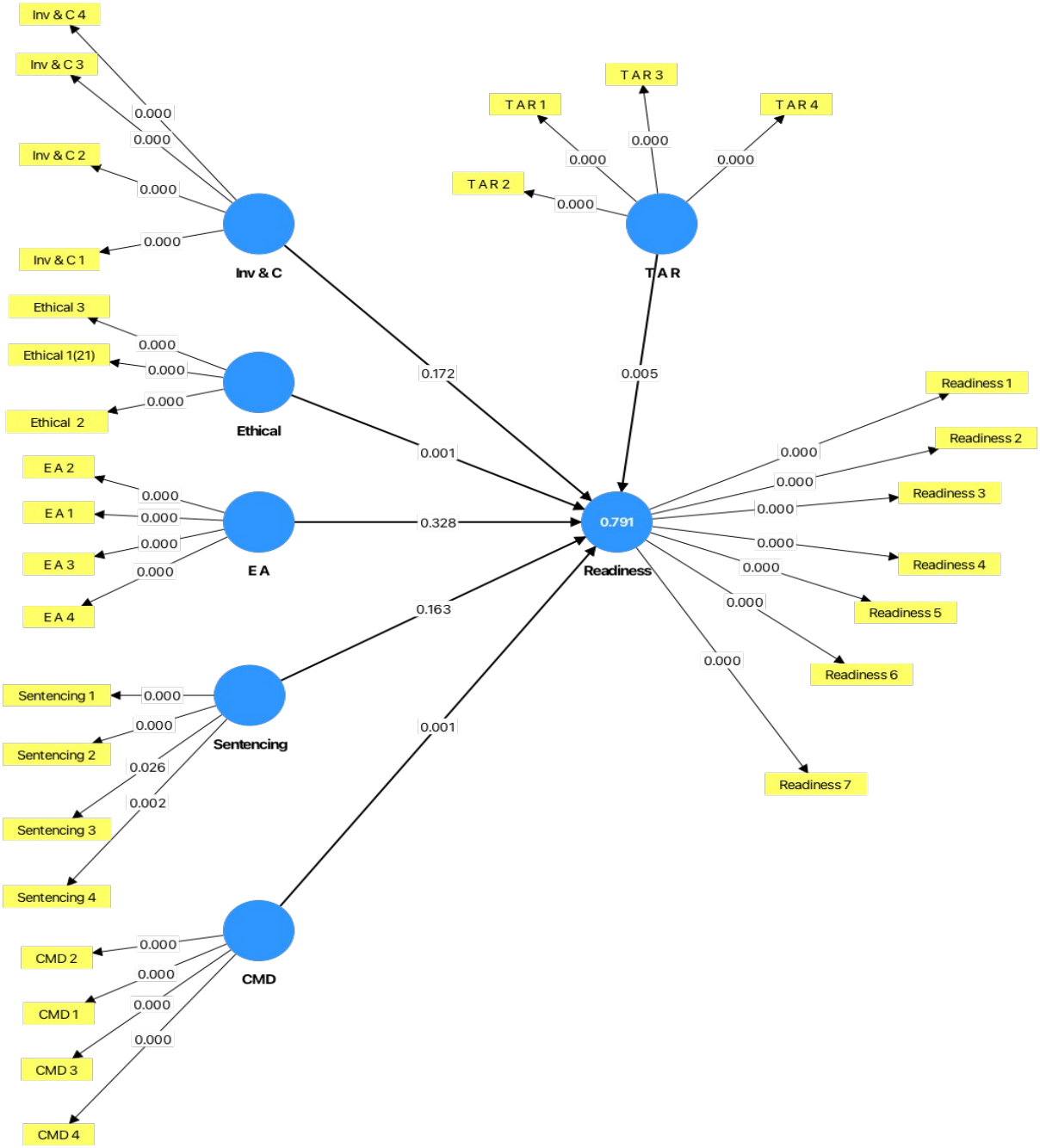


Figure 2: The Structural Model for Perception of AI Use of Judges

Accordingly, the results of the structural model are presented in Table 7.

Table 7. The Results of the Structural Model

Hypothesis	coefficient	Std error	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
CMD -> Readiness	0.324	0.307	0.098	3.320	0.001
E A -> Readiness	0.096	0.094	0.098	0.978	0.328
Ethical -> Readiness	0.240	0.248	0.071	3.405	0.001
Inv & C -> Readiness	0.128	0.130	0.094	1.366	0.172
Sentencing -> Readiness	0.123	0.139	0.088	1.396	0.163
T A R -> Readiness	0.238	0.234	0.085	2.809	0.005

5.4 Structural Path Coefficients, R^2, f^2 and Q^2

The model explained approximately 42% of the variance in judicial readiness for AI adoption ($R^2 = 0.420$), indicating moderate explanatory power. The effect-size analysis (f^2) was used to assess the substantive contribution of individual predictors to the explained variance in judicial readiness. Based on the reported results, CMD, TAR, and Ethical made meaningful contributions to the endogenous construct, consistent with their statistically significant path coefficients. The exact f^2 values should be reported in the final manuscript rather than described only as "minor" or "moderate."Predictive relevance was assessed using Q^2. A Q^2 value greater than zero would indicate predictive relevance of the model for the endogenous construct. The actual Q^2 value should therefore be reported alongside the interpretation. The structural model results collectively indicate that judicial readiness is more strongly associated with case-management functionality, ethical considerations, and transparency/accountability/rule-of-law requirements than with evidence analysis, sentencing, or investigation and inter-agency collaboration. This pattern provides empirical support for a function-specific and governance-sensitive model of judicial AI readiness. If demographic or professional variables were

included as controls, their effects should be reported separately and explicitly identified as control-variable paths. They should not be introduced only in the narrative without corresponding model results. Table 8 presents the variance inflation factor (VIF) values for the structural paths.

Table 8: VIF Values for Structural Paths

Structural Path	VIF
CMD -> Readiness	3.526
E A -> Readiness	2.098
Ethical -> Readiness	1.359
Inv & C -> Readiness	2.690
Sentencing -> Readiness	2.459
T A R -> Readiness	2.310

ANALYSIS AND FINDINGS

6.1 Finding 1: AI-Assisted Evidence Analysis and Judicial Readiness

The PLS-SEM results indicate a positive but statistically non-significant relationship between perceptions of AI-assisted evidence analysis (EA) and judicial readiness for AI adoption ($\beta = 0.096$, $t = 0.978$, $p = 0.328$). Accordingly, H1 is not supported. Although the positive coefficient suggests that greater perceived utility of AI for evidence analysis is associated with higher judicial readiness, the effect is insufficient to establish a statistically significant relationship. The descriptive results nevertheless indicate considerable perceived utility. Respondents agreed that AI could improve the speed and accuracy of evidence review (EA1; Mean = 3.369), reduce potential human error (EA2; Mean = 3.692), and improve judicial assessment in complex cases (EA3; Mean = 3.492). The highest mean was recorded for access to AI tools for examining evidence (EA4; Mean = 4.000), indicating relatively strong openness to AI-assisted evidence analysis.

Qualitative responses further contextualise these perceptions. Judges identified potential value in processing large volumes of digital records, forensic data, and electronic communications, particularly where conventional review is time-consuming. However, AI was generally viewed as a decision-support mechanism rather than a substitute for judicial judgment. Thus, perceived functional usefulness alone does not appear sufficient to generate statistically significant readiness for adoption. Taken together, the finding suggests that judicial readiness for AI-assisted evidence analysis is functionally favourable but empirically constrained. Judges recognise its potential analytical benefits, but such benefits do not, by themselves, translate into significantly greater readiness to adopt AI. This distinction indicates that acceptance may depend on additional conditions, including reliability, transparency,

evidential verifiability, and preservation of judicial responsibility. Evidence analysis may therefore represent a potentially acceptable application of AI, provided that algorithmic assistance remains subordinate to human judicial evaluation.

6.2 Finding 2: AI-Assisted Sentencing and Judicial Readiness

The PLS-SEM results show a positive but statistically non-significant relationship between perceptions of AI-assisted sentencing and judicial readiness for AI adoption ($\beta = 0.123$, $t = 1.396$, $p = 0.163$). Accordingly, H2 is not supported. Although the positive coefficient indicates a modest association between favourable perceptions of AI-assisted sentencing and readiness, the evidence does not establish a statistically significant effect. The descriptive results indicate moderate support for sentencing-related applications (Means = 3.185–3.262), while stronger agreement was observed regarding AI's potential to improve sentencing consistency (Sentencing 2; Mean = 4.108). This suggests that judges recognise the potential value of AI in promoting consistency but remain cautious about its broader application in sentencing. This caution is understandable given that sentencing requires consideration of individual circumstances, proportionality, contextual factors, and judicial discretion. The non-significant relationship therefore indicates that perceived functional benefits, particularly consistency, are insufficient on their own to increase judicial readiness for AI-assisted sentencing.

6.3 Finding 3: AI-Assisted Case Management and Judicial Readiness

The PLS-SEM results demonstrate a positive and statistically significant relationship between perceptions of AI-assisted case management and judicial readiness for AI adoption ($\beta = 0.324$, $t = 3.320$, $p = 0.001$). Accordingly, H3 is supported. Among the functional dimensions examined, case management shows the strongest positive relationship with judicial readiness, indicating that perceived utility in this domain is particularly relevant to judges' willingness to consider AI adoption. The descriptive results are consistent with this finding, with case-management indicators recording relatively high mean scores (3.738–4.123). Respondents therefore generally recognised AI's potential to improve workflow organisation, procedural monitoring, administrative efficiency, and timely case disposal.

Qualitative responses further indicate that judges associate AI-assisted case management with reducing case backlogs, monitoring procedural progress, and reducing routine administrative workloads. These functions may allow judicial officers to devote greater attention to substantive legal analysis and adjudication while retaining human control over judicial decisions. The significant relationship also distinguishes case management from the non-significant relationships observed for sentencing (H2) and evidence analysis (H1). This supports the study's function-specific account of judicial AI readiness: AI is more readily accepted where it enhances administrative and procedural capacity without directly displacing judicial discretion. Accordingly, AI-assisted case management appears to represent a comparatively viable area for judicial AI adoption in Bangladesh, particularly where deployment is accompanied by appropriate human oversight, accountability, and legal safeguards.

6.4 Finding 4: Transparency, Accountability, and Rule-of-Law Compliance (TAR)

The PLS-SEM results demonstrate a positive and statistically significant relationship between TAR and judicial readiness for AI adoption ($\beta = 0.238$, $t = 2.809$, $p =$

0.005). Accordingly, H4 is supported, indicating that judicial readiness is associated not only with perceived AI functionality but also with perceptions of transparency, accountability, and legal compliance. The TAR indicators recorded mean scores of 3.492–3.754, indicating generally favourable perceptions of the importance of these governance requirements. The results suggest that technological capability alone is insufficient for judicial acceptance; AI must also remain subject to legal standards, institutional scrutiny, and accountable decision-making. Qualitative responses reinforce this interpretation, particularly through concerns about institutional trust and the comprehensibility of AI outputs. Respondents emphasised that AI-assisted outputs are more acceptable when judges can understand, scrutinise, and assume responsibility for their use. Concerns regarding opaque or "black-box" systems therefore relate directly to the ability to evaluate and justify AI-supported processes within judicial procedures. Overall, the finding indicates that judicial AI readiness is governance-dependent. The significant TAR–readiness relationship suggests that AI adoption is more institutionally acceptable when supported by transparency, accountability, legal compliance, and meaningful human scrutiny. Thus, the legitimacy of judicial AI depends not solely on technological performance but on its integration within governance arrangements that preserve legal validity, procedural accountability, and judicial responsibility.

6.5 Finding 5: AI-Assisted Investigation and Inter-Agency Collaboration (INV&C)

The PLS-SEM results show a positive but statistically non-significant relationship between AI-assisted investigation and inter-agency collaboration (INV&C) and judicial readiness for AI adoption ($\beta = 0.128$, $t = 1.366$, $p = 0.172$). Accordingly, H5 is not supported. Although the positive coefficient indicates a favourable association, the effect is insufficiently strong to establish a statistically reliable relationship in the present sample. Descriptively, respondents reported relatively favourable perceptions of AI in investigative and collaborative functions, with mean scores ranging from 3.831 to 4.200. The divergence between these positive perceptions and the non-significant structural effect suggests that judges may recognise the practical value of AI for information sharing and institutional coordination without viewing these benefits as sufficient to increase overall readiness for judicial AI adoption. Qualitative responses indicate that this caution is associated with concerns over institutional boundaries, data reliability, verification, and accountability when AI-supported information originates from law-enforcement or other external institutions. These concerns are particularly relevant where such information may influence judicial assessment. Overall, the finding indicates that perceived functional utility does not necessarily translate into judicial readiness where AI operates across institutional boundaries. The result reinforces the study's function-specific account of AI acceptance: investigative and inter-agency applications may be considered useful, but their adoption requires adequate safeguards concerning data integrity, verification, accountability, and procedural integrity.

6.6 Finding 6: Ethical Concerns and Judicial Readiness (Ethical)

The PLS-SEM results show a positive and statistically significant relationship between Ethical Concerns (Ethical) and judicial readiness for AI adoption ($\beta = 0.240$, $t = 3.405$, $p = 0.001$). Accordingly, H6 is supported. The high mean scores for the Ethical indicators (4.385–4.569) further indicate strong recognition of the importance of fairness, accountability, transparency, and bias mitigation in judicial AI deployment. This finding should be interpreted carefully. The Ethical construct captures recognition of ethical requirements and safeguards, rather than unqualified acceptance of AI. The positive relationship therefore suggests that judicial readiness is greater where AI adoption is perceived as requiring, and being supported

by, appropriate safeguards concerning fairness, accountability, transparency, bias mitigation, and human oversight.

The qualitative evidence reinforces this interpretation. Respondents emphasised that inadequate safeguards could threaten judicial independence, procedural fairness, and fundamental rights, notwithstanding the potential functional benefits of AI. Ethical governance therefore appears to operate not merely as a constraint on adoption but as a condition of institutional legitimacy and acceptance. Taken together with the other findings, Ethical reinforces the study's function-specific and governance-sensitive account of judicial AI readiness. While case management showed the strongest significant functional relationship with readiness, sentencing and investigation/inter-agency collaboration were non-significant. The significant Ethical relationship indicates that judicial acceptance of AI is closely associated with the perceived adequacy of the governance conditions under which it is deployed. Overall, the finding suggests that judicial AI readiness depends not only on technological utility but also on ethical safeguards, accountability, transparency, legal compliance, and meaningful human oversight. For Bangladesh, responsible AI adoption should therefore prioritise applications that support judicial functions without displacing human adjudicative authority and should be accompanied by appropriate ethical and institutional safeguards.

DISCUSSION AND CONCLUSION

This study provides an empirical assessment of judicial readiness for artificial intelligence (AI) adoption in Bangladesh by integrating PLS-SEM findings with contextual insights from judicial respondents. The results indicate that judicial readiness is shaped not by technological capability alone but by the functional utility, institutional governance, and ethical conditions associated with AI deployment. AI-assisted case management (CMD), transparency, accountability and rule-of-law compliance (TAR), and ethical considerations (Ethical) show statistically significant positive relationships with judicial readiness. AI-assisted evidence analysis (EA) is positive but not statistically significant, while AI-assisted sentencing (Sentencing) and investigation and inter-agency collaboration (INV&C) are also positive but not statistically significant. These results suggest that judicial AI acceptance is function-specific and governance-sensitive, with greater readiness where AI is perceived as supporting judicial processes without displacing human adjudicative authority or compromising institutional legitimacy.

The discussion therefore interprets the empirical findings in relation to the study's conceptual framework and the broader socio-legal literature on AI governance, judicial independence, procedural fairness, accountability, transparency, and the rule of law. Particular attention is given to the contrasting levels of judicial readiness across different AI applications and to the role of ethical and institutional safeguards in shaping acceptance. The section subsequently considers the theoretical and practical implications of the findings for responsible AI adoption in Bangladesh's judiciary, followed by the study's limitations and directions for future research. Finally, the conclusion identifies the institutional and normative conditions necessary for AI adoption to remain consistent with judicial autonomy, procedural legitimacy, and the rule of law.

7.1 Function-Specific Patterns of AI Adoption

The findings demonstrate that judicial readiness for AI adoption varies by function. AI-assisted case management showed the strongest statistically significant relationship with readiness ($\beta = 0.324$, $t = 3.320$, $p = 0.001$), indicating that perceived utility in administrative and procedural functions is associated with greater readiness. AI-assisted evidence analysis was also positively associated with readiness ($\beta = 0.096$), but the relationship was not statistically significant ($p = 0.328$). Nevertheless, the descriptive and qualitative findings indicate that judges recognise AI's potential to support the processing of large volumes of documentary, digital, and forensic information. The qualitative evidence suggests that judges primarily conceptualise AI as a decision-support technology rather than a substitute for judicial judgment. This distinction helps explain the stronger association observed for case management, where AI can support workflow, information processing, and administrative efficiency without directly determining substantive outcomes. AI therefore appears more acceptable where its use complements judicial functions while preserving human responsibility for adjudication.

By contrast, AI-assisted sentencing and investigation/inter-agency collaboration produced positive but statistically non-significant relationships with readiness ($\beta = 0.123$, $p = 0.163$; $\beta = 0.128$, $p = 0.172$, respectively). The findings suggest that perceived usefulness in these areas does not, by itself, translate into greater judicial readiness. Sentencing involves individualised and normative judicial assessment, while investigation and inter-agency collaboration extend across judicial, law-enforcement, prosecutorial, and administrative domains. Both therefore raise stronger concerns regarding judicial discretion, institutional boundaries, evidentiary reliability, and accountability.

These findings extend conventional technology-acceptance perspectives by suggesting that perceived usefulness in judicial settings is conditioned by task characteristics and legal responsibility. Consistent with the Technology Acceptance Model (TAM) and Task-Technology Fit (TTF), technological utility and task compatibility remain relevant; however, judicial AI adoption also depends on the degree of discretion involved, the institutional responsibility attached to the function, and its potential legal consequences. Accordingly, the findings support a function-specific approach to judicial AI adoption. Applications such as case management may constitute appropriate entry points for AI integration, whereas applications affecting sentencing or investigative processes require more rigorous scrutiny, human oversight, and governance safeguards. This approach avoids treating judicial AI adoption as a uniform technological decision and instead aligns deployment with the nature, sensitivity, and legal consequences of the judicial function concerned.

7.2 Ethical and Governance Considerations

The findings indicate that ethical and governance conditions are significant determinants of judicial readiness for AI adoption. Ethical Concerns (Ethical) demonstrated a positive and statistically significant relationship with judicial readiness ($\beta = 0.240$, $t = 3.405$, $p = 0.001$), with high mean scores for fairness, accountability, transparency, and bias mitigation (4.385–4.569). This result should not be interpreted as suggesting that ethical risks promote AI adoption. Rather, it indicates that recognition of ethical requirements is associated with greater readiness, suggesting that safeguards are integral to the perceived legitimacy and acceptability of judicial AI.

Similarly, Transparency, Accountability, and Rule-of-Law compliance (TAR) showed a positive and statistically significant relationship with judicial readiness (β = 0.238, t = 2.809, p = 0.005). This finding indicates that judicial readiness depends not only on AI's functional utility but also on whether its deployment can operate within institutional arrangements that preserve transparency, accountability, and legal conformity. Such conditions are particularly important where AI-supported processes may influence procedural decisions or the exercise of judicial authority.

The qualitative evidence reinforces these findings. Respondents emphasised the need to understand, scrutinise, and attribute responsibility for AI-supported outputs. Concerns regarding opaque or "black-box" systems therefore extend beyond technical explainability to issues of auditability, traceability, and meaningful human oversight. Ethical and governance safeguards consequently function as institutional mechanisms through which judges assess whether AI's potential benefits are compatible with judicial independence, procedural fairness, and legal accountability.

Taken together, the Ethical and TAR findings demonstrate that judicial AI readiness is both function-specific and governance-sensitive. Technological capability alone is insufficient to establish institutional acceptance. Legitimate deployment requires clear accountability, transparency, legal conformity, bias mitigation, and meaningful human oversight. The findings therefore support a socio-legal understanding of judicial AI adoption in which technological integration depends not only on what AI can do, but also on the normative and institutional conditions governing its use.

THEORETICAL AND PRACTICAL IMPLICATIONS

The findings contribute to the emerging literature on AI and judicial governance by advancing a function-specific, governance-sensitive, and context-responsive account of judicial AI readiness. The implications are threefold.

7.3.1 Theoretical Implications

First, the study advances a function-specific understanding of judicial AI readiness. The results show that readiness varies across AI applications. Case management has the strongest significant relationship with readiness (β = 0.324, p = 0.001), whereas sentencing and investigation/inter-agency collaboration show positive but non-significant relationships. Evidence analysis is also positive but non-significant (β = 0.096, p = 0.328). This pattern suggests that AI acceptance depends partly on the nature of the judicial task, the degree of discretion involved, and the consequences of technological intervention. The study therefore extends technology-acceptance perspectives by showing that perceived usefulness in judicial settings is conditioned by task sensitivity and judicial responsibility.

Second, the study advances a socio-legal account that integrates functionality, ethics, and governance. The significant relationships between Ethical Concerns (β = 0.240, p = 0.001), Transparency, Accountability and Rule of Law (β = 0.238, p = 0.005), and judicial readiness indicate that technological utility alone does not explain judicial AI acceptance. Rather, judges' readiness is associated with the institutional and normative conditions under which AI operates, including transparency, accountability, legal conformity, ethical safeguards, and human

oversight. This supports a governance-sensitive conception of judicial AI adoption in which technological functionality and institutional legitimacy are analytically interconnected.

Third, the study contributes context-specific empirical evidence from a developing-country judiciary. By examining judicial officers in Bangladesh, the study demonstrates that AI readiness must be understood within the institutional conditions of an emerging digital judiciary, including caseload pressures, evolving technological infrastructure, and constraints on institutional capacity. The findings therefore caution against directly transferring AI governance models developed in technologically advanced jurisdictions and instead emphasise the importance of context-sensitive institutional, legal, and professional conditions. Overall, the theoretical contribution lies in reframing judicial AI readiness as neither a purely technological nor an individual technology-acceptance phenomenon, but as a function-specific and socio-legally conditioned form of institutional readiness.

7.3.2 Practical and Policy Implications

The findings have several implications for the responsible implementation of AI within Bangladesh's judiciary.

First, AI adoption should be phased and function-specific. Applications with clear administrative or analytical benefits and limited interference with adjudicative discretion—particularly case management and selected evidence-support functions—may provide appropriate initial areas for implementation. By contrast, applications involving sentencing and investigative processes warrant greater scrutiny, testing, and judicial oversight because of their closer connection to substantive judgment, evidentiary integrity, and institutional boundaries.

Second, governance and ethical safeguards should be embedded from the outset. The significant effects of Ethical Concerns and Transparency, Accountability, and Rule of Law compliance indicate that institutional safeguards are important to judicial readiness. AI deployment should therefore incorporate transparency, explainability, accountability, bias mitigation, data protection, auditability, human oversight, and legal compliance. Clear responsibility should remain with human judicial authorities for decisions informed by AI-generated outputs.

Third, judicial capacity building should accompany technological deployment. Training should extend beyond technical skills to include AI limitations, algorithmic bias, data protection, interpretation and verification of AI outputs, and the legal and ethical implications of AI-assisted judicial processes. This would strengthen judges' capacity to exercise critical and independent judgment when using AI-supported tools.

Fourth, technological infrastructure and institutional coordination should develop alongside AI adoption. Effective implementation requires reliable digital infrastructure, secure information systems, appropriate data-governance arrangements, and coordination among relevant judicial and administrative institutions. Development should also involve consultation with judges, court personnel, legal professionals, technology specialists, and policymakers to ensure that AI systems reflect operational requirements while preserving institutional accountability.

Overall, the findings do not support rapid or technology-driven AI adoption. Rather, they favour a selective, incremental, and governance-led approach. Bangladesh's judiciary should

prioritise applications that provide demonstrable functional benefits while preserving human judicial responsibility, and should strengthen legal, ethical, institutional, and technical safeguards before extending AI to functions with greater implications for substantive adjudication.

LIMITATIONS AND FUTURE RESEARCH

Despite its empirical and theoretical contributions, the study has several limitations that should be considered when interpreting the findings and that provide directions for future research.

First, the study relies on a relatively small and voluntary sample of 100 judicial officers. Although the sample was suitable for the PLS-SEM analysis undertaken, the limited response rate and non-probability sampling constrain the generalisability of the findings. The results should therefore not be interpreted as statistically representative of the entire Bangladeshi judiciary. Future research could employ larger samples and, where feasible, probability-based sampling to improve representativeness and enable comparisons across judicial levels, professional experience, and institutional settings.

Second, the study is contextually confined to Bangladesh. The findings reflect the country's particular legal, institutional, technological, and professional environment and should therefore be generalised to other jurisdictions with caution. Comparative research across jurisdictions with different levels of judicial digitalisation, regulatory frameworks, and institutional capacity could determine whether the function-specific and governance-sensitive patterns identified here are context-specific or more broadly applicable.

Third, the cross-sectional design limits assessment of temporal change and causal inference. The study captures judicial perceptions at a particular stage of digital transformation and cannot establish how readiness may evolve following exposure to AI, professional training, institutional reforms, or actual implementation. Longitudinal research could therefore examine changes in judicial readiness over time and whether perceived readiness translates into sustained and responsible AI adoption.

Fourth, the study primarily reflects the perspectives of judicial officers. Although judges are central to judicial AI readiness, implementation also involves lawyers, court personnel, administrators, policymakers, technology developers, and other stakeholders. Future multi-stakeholder research could examine their respective perceptions of AI's benefits, risks, and governance requirements and identify areas of convergence or disagreement.

Fifth, the study examines perceived readiness rather than the observed effects of AI in operational judicial environments. Readiness does not necessarily translate into effective implementation or desirable outcomes. Future research should therefore examine the actual effects of AI-assisted systems on case-processing time, backlog reduction, evidentiary assessment, consistency, procedural fairness, accountability, and judicial independence. Longitudinal, observational, experimental, or mixed-method designs would be particularly valuable for determining whether perceived benefits are realised in practice.

Finally, limited comparable empirical evidence on judicial AI in developing-country contexts constrains cross-national comparison. Future research could develop comparative datasets examining how judicial culture, institutional trust, technological capacity, ethical

regulation, and legal safeguards shape AI readiness across jurisdictions. Such research would help establish whether the relationships identified in this study are specific to Bangladesh or reflect broader patterns of judicial AI governance.

CONCLUSION

This study examined judicial readiness for artificial intelligence (AI) adoption in Bangladesh through a quantitative assessment of judges' perceptions of different AI applications and the ethical and governance conditions surrounding their use. The findings indicate that judicial readiness is function-specific and governance-sensitive rather than determined by technological capability or perceived efficiency alone. The strongest statistically supported functional relationship was observed for AI-assisted case management ($\beta = 0.324$, $t = 3.320$, $p = 0.001$), suggesting that applications directed towards administrative and procedural efficiency may provide a comparatively appropriate starting point for judicial AI adoption. AI-assisted evidence analysis also showed a positive relationship with readiness, although its significance should be interpreted in accordance with the corresponding structural-model result.

By contrast, AI-assisted sentencing and AI-assisted investigation and inter-agency collaboration showed positive but statistically non-significant relationships with judicial readiness. These findings do not indicate outright rejection of such applications; rather, they suggest that perceived functional benefits in areas more closely connected to substantive adjudication, investigative processes, or institutional boundaries are not, by themselves, sufficient to produce statistically significant increases in overall readiness. The findings therefore reinforce the importance of preserving human judicial responsibility and discretion where AI may have more direct implications for adjudicative judgment.

The study also demonstrates the importance of ethical and governance considerations. Ethical Concerns ($\beta = 0.240$, $t = 3.405$, $p = 0.001$) and Transparency, Accountability, and Rule-of-Law compliance ($\beta = 0.238$, $t = 2.809$, $p = 0.005$) both showed positive and statistically significant relationships with judicial readiness. These results suggest that judges' readiness to consider AI is associated not only with what AI can accomplish but also with whether its use can be situated within arrangements that support fairness, transparency, accountability, legal compliance, bias mitigation, human oversight, and judicial independence. Ethical and governance safeguards should therefore be understood as institutional conditions for legitimate AI adoption rather than as secondary considerations added after technological implementation.

Taken together, the findings support a function-specific, ethically grounded, and governance-sensitive approach to judicial AI adoption. The study's principal socio-legal contribution is to show that judicial technology acceptance cannot be adequately explained through technological usefulness alone. The nature of the judicial task, the degree of discretion involved, and the institutional and normative conditions governing technological use all form part of the context in which AI adoption is evaluated.

For Bangladesh, the practical implication is that judicial AI adoption should proceed incrementally and selectively. Initial attention may appropriately be directed towards applications that support administrative and analytical functions while preserving human adjudicative authority. At the same time, deployment should be accompanied by appropriate safeguards concerning transparency, accountability, data protection, explainability, bias mitigation, auditability, and human oversight. Judicial training and institutional capacity building should accompany technological development so that judges are equipped to critically evaluate AI-supported outputs rather than treating them as authoritative substitutes for legal judgment.

The study's conclusions should be interpreted in light of its relatively small voluntary sample, Bangladesh-specific context, cross-sectional design, and focus primarily on judicial perceptions rather than observed outcomes of deployed AI systems. Future research should therefore test these relationships using larger and comparative samples, longitudinal designs, and empirical evaluations of AI systems in actual judicial environments. Within these limitations, the study provides empirical evidence that responsible judicial AI adoption is not simply a question of whether courts can use AI, but under what functions, conditions, and safeguards its use can remain compatible with judicial independence, procedural fairness, and the rule of law.

DECLARATIONS

Data Availability Statement

The data that support the findings of this study were collected through a structured questionnaire administered via a Google Forms survey. Due to confidentiality and ethical considerations, the dataset is not publicly available. However, anonymized data may be made available by the corresponding author upon reasonable request.

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Conflict of Interest

The corresponding author declares that there is no conflict of interest.

Ethics Approval and Consent to Participate

This study involved a survey conducted through personal communication. Participation was entirely voluntary, and informed consent was obtained from all participants through their spontaneous and willing responses. No sensitive personal data was collected, and participants were not exposed to any risk or harm. Given the non-invasive nature of the study and the absence of institutional affiliation at the time of data collection, formal ethical approval was not required. This is consistent with standard research practices for minimal-risk social research involving voluntary participation and anonymised data.

Consent to Publish: Not applicable.

AI-Assisted Writing

Large language models were used solely to support language polishing and structural refinement during the preparation of this manuscript. AI tools were not used for conceptual development, framework design, metric formulation, threshold determination, data interpretation, or substantive analysis. All theoretical choices, analytical judgments, and interpretive conclusions are the sole responsibility of the author.

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