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A CONCEPTUAL AND TECHNOLOGY-ENABLED FRAMEWORK FOR OPERATIONALIZING INDIAN KNOWLEDGE SYSTEMS USING MODERN IT TOOLS

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ABSTRACT
One of the research topics that has gained the interest of scholars and policy-makers is Indian Knowledge Systems (IKS), which may be of great value to the progress of education, information technology–enabled innovation, and sustainable development. Based on holistic epistemologies emphasizing ethical imperatives, balance, and integrated knowledge, IKS offer meaningful alternatives to mainstream Western paradigms. Nonetheless, existing literature remains largely focused on philosophical interpretations of IKS, with limited emphasis on technological operationalization, system design, and measurable outcomes, making practical implementation challenging. This paper presents a critical analysis of contemporary literature on IKS in the contexts of education and technology to identify key gaps related to empirical validation, IT-enabled implementation frameworks, technology-mediated interactions, and stakeholder integration. In response, the study proposes a conceptual and technology-enabled operationalization framework that translates IKS philosophical foundations into actionable practices supported by modern IT tools such as digital platforms, learning management systems, data analytics, and artificial intelligence. The proposed framework bridges traditional knowledge systems with modern innovation ecosystems by enabling scalable, adaptive, and measurable implementation of IKS across learning and technology-driven environments. By integrating philosophical foundations with IT-supported operational mechanisms and outcome-based evaluation, the study offers a systematic pathway for transforming IKS from a normative discourse into empirically measurable, technology-mediated systems of practice, while also outlining directions for future research, validation, and policy alignment.

Keywords: *Indian Knowledge Systems (IKS), Information Technology, Technology-Enabled Framework, Digital Transformation, Educational Technology, Operationalization, Measurable Impact*

I. INTRODUCTION
Indian Knowledge Systems (IKS) are comprised of many resources that one can access in his or her ancestral history to formulate an idea of their role in the world. These resources are characterized by being holistic, and developed as a means of seeing the majority of things in the universe being equally vital, instead of one kind of knowledge or other being valuable than the other, and to share moral and ethical values and beliefs among individuals. It is an issue that has seen a high re-emergence of interest among scholars and policymakers over the last few years in the promotion of the use of IKS in particular in higher education reform, the aims of sustainable development, and accountability in technological development. Government efforts to encourage IKS in education include the National Education Policy (NEP) 2020 adopted by the Indian government in December 2020, and IKS has been found to be key elements in encouraging interdisciplinary learning; cultural identity; and holistic approaches to personal growth and group development. Meanwhile, as artificial intelligence, data analytics and online learning continue to proliferate at a quick pace, the need to design and put in place ethical, human and culture-based frameworks in an effort to improve innovation has become highly pronounced. Bearing this in mind, Indigenous Knowledge Systems (IKS) have gained greater acceptance as a fundamental intellectual resource to guide contemporary pedagogical practices and principles of technological design [2,4,10]. Yet, much of the current literature that relates to IKS has been largely conceptual and normative and centered on philosophical understandings and cultural relevance and advocacy on the policy level with minimal empirical support and practical implementations of IKS usage [2,9,10]. Further, NIL has done minimal quantitative research on the inculcation of IKS into learning so as to offer credible information to gauge the student learning impact, assessment competence and skill acquisition [4,9,12]. The same lack of empirical validation of IKS can be noted in the research on the use of IKS in new technologies and the systems of governance as only the philosophical research has been investigated and no practical implementation of IKS has been implemented and its performance indicators have not been measured to identify the actual impact of IKS on the new technologies and societal frameworks [6,7,11]. The absence of effective systems to convert the philosophical background of IKS into practice educational and technological application poses a significant research gap within the study dedicated to the educational methodology, and little utilization of technology-mediated instruments, the absence of interactions with major stakeholders, and a self-evident lack of scalability between institutions and culture are all limiting factors in the application of IKS-based methodologies. [1,5,8]. The transformative potential of Indian Knowledge Systems might go to waste without systematic

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operationalizations and quantifiable results. To overcome these constraints, this project aims at creating a new framework that relates philosophical underpinnings of Indian knowledge systems (IKS) with the real implementation of the IKS in education and technology. In order to do that, the authors thoroughly review the literature to find out the main gaps in the existing structures and introduce their own conceptual research framework to operationalise IKS using technology-aided practices and indicators of measurable impact. By so doing, they make IKS viable, operational systems which are capable of making a substantial contribution towards the emergence of opportunities today in the areas of innovation, policy, and reform of education. The newness in the research is its integrative and operationally minded analysis of the Indian knowledge systems - unlike most of the extant literature, the research focuses neither on philosophical explanations of knowledge nor on policy objectives. The authors introduce a technology mediated conceptual framework which will enable systematic translation of IKS principles into practices and measurable results in the context of education and technology. As a result of developing a clear connection between philosophical groundwork, operational policy, technological mediation and performance-based assessment, this study marks a change in the direction of IKS research toward a more normative-oriented discourse to a practice that is empirically testable and can be generalized.

II. LITERATURE REVIEW

The literature on Indian Knowledge Systems (IKS) and other indigenous ways of knowing has been increasing in a number of fields such as education, technology, government and sustainability. Although a lot has already been known about the philosophical background of these systems and their cultural appropriateness due to the available literature; what appears to be lacking though is the empirical validation of IKS empirical frameworks operationally and measurement of the effect of IKS on outcomes. As an example, Ahmadi and HaghighatBin (2018) suggest a value-based model of encompassing both the physical and intangible cultural heritage in the planning of the rural landscapes in Iran. Their study shows how indigenous values can guide a sustainable development practice. Although the proposed framework provides a strong conceptual linkage, it is virtually purely based on qualitative approach, therefore, it does not present any quantitative indicators or longitudinal analysis, which makes it hard to apply this framework to a different culture and geographical region. According to Aithal et al. (2019), IKS can be used to promote the innovation of technology through offering the principles of ethical responsibility, balance and holistic thinking, which could be used to inform the digital transformation and system design. Although the work of the authors is effective in connecting the traditional philosophy fields to the current discussion of technology, the authors are not concerned with empirical research or quantifiable results in terms of productivity, efficiency, and innovation benefits of IKS-based technology development. Ali [3] investigated eco-innovation in heritage using financial viability model, where he targeted the industry of Khadi in Bangladesh. Ali provided a sufficient amount of quantitative analysis and the commercial potential of these sorts of industries in an economic performance approach, but did not provide much information concerning the mechanisms of technology adoption of IKS-based industries, the stakeholders, and the role of digital platforms in facilitating the processes of heritage-based innovation systems. In their study, Chandratreya et. al. [4] examined the integration of Indian Knowledge Systems (IKS) in higher education in terms of curriculum transformation, interdisciplinary learning paradigm and the alignment with the national paradigm of educational reform. The authors used a strong normative framework and policy arguments, but they fail to show an empirical evidence of the effectiveness of IKS integration in terms of learning outcomes, faculty preparedness, or institutional barriers regarding IKS integration. Choto and Remadan [5] are also suggesting a revolutionary approach of practice-based pedagogy model of teaching architecture, that links teaching, research and professional practice. The model presented by the authors illustrates a contextual relevance and pedagogical novelty, yet since the validation of the model was based on one institutional case, student outcome measures of IKS pedagogies, or further incorporation of digital and emerging technologies was not offered in the model. The article by Danielsen deals with the topic of the bridging of Western scientific and indigenous (or local/handed down) forms of knowledge as to the issue of the regulation of natural resources in the age of global change. Another aspect that is highlighted in this paper is the necessity of pluralism in research by giving examples of how both scientific and traditional forms of information ecology can be used to develop inclusive forms of government. Nevertheless, the article lacks enough information regarding the proper way of balancing the two forms of information, either a qualitative or quantitative manner (i.e., presenting quantifiable data that reveals whether an integrated method bears practical effect). The article by Lee and Shin involves the application of artificial intelligence (AI) to make the interpretation of cultural heritage more effective using the Old Jambatan Tamparuli Bridge as a case study. This article reveals examples of AI opportunities to engage and storytell the cultural heritage; nevertheless, it does not provide any empirical evidence on the types of AI tools that were applied to the cultural heritage engagement, the levels of visitor engagement with the cultural heritage with the help of AI tools, or the effects of AI tools on the understanding of the cultural heritage or visitor engagement

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with it. The work of Meera and Vinodan is a commentary on the purpose of festivals (e.g., by placing an emphasis on the Thrissur Pooram) as a means of adapting communities to sustainability, as well as crisis management. Their suggested assessment model offers a qualitative understanding of adaptive systems and how they can be used to benefit the success of events due to adaptive processes of governance. Nevertheless, the methodology they use fails to offer any quantitative data to justify the applicability of their evaluation system to other contexts. In his work, Pillai discusses how the assessment reform under NEP 2020 can lead to the integration of indigenous knowledge into the mainstream education and how assessment reform can take place through the cooperation of the various forms of knowledge systems in an educational setting. The study has a philosophical alignment and an appraisal of formative assessment. Nonetheless, the question of the impact of different assessment strategies that are already revised on the engagement of student participants and their learning outcomes or skills development is not supported empirically. This is a considerable weakness especially since technologies based assessment is usually common in most sectors of education. Pisal (2011) gives an introduction to the Indian Knowledge System in the context of the idea of education and transfers the epistemological and cultural applicability of the system to the contemporary educational practice. The author, nonetheless, fails to put empirical evidence to include either of the epistemological or cultural dimensions of Indian Knowledge as they are particularly pertinent to the development of knowledge, understanding of knowledge and application of knowledge to the students in the present day. This leads to the fact that the article is rather descriptive than prescriptive and does not present clear operational models and criteria in terms of which it is possible to evaluate the potential educational or technological impacts. Ray and Ray (2011) aim to further the implementation of the Indigenous Knowledge Systems in the creation of artificial intelligence (AI) governance systems, investigating Maori and Navajo views. Their article is a valuable critical evaluation of Westernized AI governance both in the past and at present with regard to ethics; however, it fails to generate operationalized traditional Indigenous Governance using algorithms. Neither do they provide any form of evidence of validating the established and operationalized Indigenous knowledge as far as the development of the governance processes and systems is concerned. Srivastava (2011) examines the introduction of Indian languages and Indian Knowledge Systems in legal education as a way of decolonising legal education. Although the study provides a highly robust normative foundation of the cultural relevancy and inclusivity with regards to the formulation of legal and ethical values in education, it fails to provide an evaluation or measurement of the empirical evidence of the possible integration of the Indian languages or Indian Knowledge Systems into legal education and the readiness of the institutions to include such a coursework or program in their own curriculum. As the literature reviewed above demonstrates, there is a degree of philosophical richness and growing applicability of the Indigenous and Indian knowledge systems to policies in various spheres of the society. Nevertheless, it still has many gaps in the areas of empirical validation, operationalization, implementation using technologies, stakeholder involvement and scalability. The existence of such gaps shows that a more organized method is required which can transform the philosophical principles into practical models which can be implemented to generate quantifiable educational and technological outcomes.

III. RESEARCH GAPS

The quantity of studies and policy programs on Indian Knowledge Systems (IKS) in education, technology, government and sustainability are growing at a high rate, yet there is very little research that has been conducted empirically to demonstrate how these IKS strategies are implemented into quantifiable outcomes in the current educational and technological contexts. The philosophical and normative arguments of incorporating IKS-based solutions in our existing systems are strong but the empirical data of successful utilization of these ideas is not established in a definite manner (. The current research also demonstrates the importance of incorporating IKS in curricula, innovation ecosystems and governance but it does not reveal how the incorporation of IKS-based approach to interdisciplinary, multi-institutional or multi-cultural settings will lead to the outcomes that we would like to observe. I also observed that despite the increasing awareness that the digital transformation and application of new technology can help us to attain IKS approaches through research, development and evaluation, there is a lack of research to establish how new technologies can be employed to help, measure and magnify the effect of IKS endeavours in these regions. In addition, the literature that is available is more inclined to academic or policy view, omitting most of the empirical studies that involve key stakeholders like students, teachers, practitioners and communities. This underrepresentation thus constrains our understanding of what is contextually viable, institutionally ready and culturally acceptable regarding the implementation of IKS into preexisting structures [3,4,8,12]. The other reason why we can only speculate as to how IKS can fit into these contexts is that most of the case studies carried out are done in an isolated manner or on localised grounds, which restricts our capacity to generalise and come up with evidence-based models as to how we can transfer IKS [1,5,7,8]. All of the identified limitations demonstrate a serious gap in the research on the creation of an integrated, evidence-based, technology-mediated framework to deploy IKS as integrated, evidence-based,

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technology-enabled frameworks to translate the philosophical foundation of IKS into quantifiable outcomes in the form of technology and education. The first step toward repositioning IKS as a living, scalable system with a real influence on the innovation, policy and education reform is filling this gap.

IV. CONCEPTUAL FRAMEWORK

Modern IT tools such as learning management systems, artificial intelligence, and data analytics function as operational enablers that translate IKS principles into scalable and measurable practices. Literature suggests that the Indian Knowledge Systems (IKS) are devoid of convergence in philosophical thinking and action practice (particularly in education and technology). To address this weakness, this study suggests a comprehensive conceptual framework according to which IKS is a dynamic and operational system that has the potential to deliver concrete outcomes. The given framework will tend to operationalize the basic philosophical principles of IKS with the help of modern technology and empirical measurements to prove the findings. The research is based on the basic philosophical principles of Indian Knowledge Systems, which include ethical accountability, balance and harmony, and integrated knowledge at the bottom of the framework. These ideas act as the principles of guiding concepts in decision making, learning, and development of technology. The structure includes these concepts as guiding principles to govern the institutional behaviour, learning and innovation processes as opposed to viewing them as lofty ideals. On this assumption, the framework focuses on operationalization of philosophical tenets into tangible learning and technological processes. This is done by aligning the values of IKS to the learning structures, learning processes, governance, and innovation. Through this, the framework addresses the gap of the absence of the implementation models revealed in the literature review. Technology is put within the framework as being a significant enabling factor that facilitates scalability, consistency, and evaluation. The dissemination, implementation, and assessment of IKS-driven practices can be facilitated by the use of digital platforms, learning management system, data analytics and new and emerging technologies including artificial intelligence. With the traditional knowledge being preserved and used in both the contemporary educational and technological surroundings by means of technology as a mediating factor. The framework concludes with the definite focus on the results and the effect. The metrics of learning performance, engagement, the effectiveness of innovations, ethical adherence, and satisfaction of stakeholders are mentioned as the critical dimensions according to which the effectiveness of IKS-based initiatives can be measured objectively. The framework makes it easy to assess, compare and improve using evidence by relating philosophical foundations to measurable metrics. The conceptual framework proposed above is a systematic and integrative way of operationalising Indian Knowledge Systems to a systematic and effective result; between philosophical premises and practical impacts. It directly fills the literature gaps by combining the normative foundations, operational definitions, technological enablements, and outcome-based evaluations and therefore re-places IKS as an operative and scalable system to present-day education and technological innovation.

V. METHODOLOGY

The framework is designed to be implementable using standard IT infrastructures and can be validated through system prototypes, dashboards, or analytics-driven evaluation models. The proposed study employs a conceptual research methodology of qualitative approach to come up with a combined framework of operationalizing Indian Knowledge systems in education and technology. The proposed research is exploratory, and the literature does not have empirically validated models, which is why a systematic literature analysis approach is suitable. A literature review of the academic literature was conducted to examine the academic literature on the Indian Knowledge Systems, indigenous knowledge frameworks, education reform, emerging technologies, governance models and assessment practices. The inclusion criteria used in the selection of peer-reviewed articles, edited volumes, policy documents, and authoritative reports were related to the relevance to the integration of Indian Knowledge Systems, technological mediation, and outcome-based assessment. The selected literature bases its coverage of the areas in education, heritage studies, technology governance and sustainability to offer an interdisciplinary perspective. The thematic synthesis was applied to analyze the literature that identified the patterns, limitations, and conceptual relations. Philosophical workings of IKS, problems with the process, the application of digital technology, how it is assessed and measured, stakeholder involvement and scalability were some of the significant themes that were identified. These themes were used in identifying a single research gap and they also aided in the development of the proposed conceptual framework. Development of the conceptual framework was made by an iterative analytical approach in which the results of the thematic analysis were compared in terms of the research gaps detected in the literature body. Every component of the intended conceptual framework was made to overcome certain gaps in the literature in terms of operationalisation, integration of technology, and quantifiable nature. The study is a conceptual study and does not entail the use of primary empirical data or experimental validation. However, the suggested conceptual

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framework is formulated in a manner that it can be empirically tested in further studies as a case study, pilot study, survey and mixed-method study in the educational and technological sphere.

VI. DISCUSSION

The proposed study employs a conceptual research methodology of qualitative approach to come up with a combineThe findings of this paper validate the previous finding that Indian Knowledge Systems (IKS) possess much philosophical content and functionality but are not operationalized enough in the current education and technology environments. The reviewed literature has been quite explicit on the significance of being ethically responsible, thinking in a holistic manner, and making sense out of a culture; but these issues are scarcely operationalized in the context of specific practices and measurable indicators. The suggested conceptual framework will address the issue by offering a detailed framework that will connect philosophical foundations and operational strategies, technology support, and outcome measure. The emphasis on technology as an enabler and not a disruptor in the framework is consistent with the current literature trends on human-centred and ethical innovation. Digital platforms, analytics, and artificial intelligence can be used to operationalize and scale IKS initiatives without losing their cultural authenticity. This framework can be traced as a direct reaction to the weaknesses of the previous research studies that have talked about technology in an abstract manner without indicating how it is utilized in operation and scaling. In addition, the policy imperatives of the National Education Policy 2020 are also dealt with by the framework, as it provides a systematic way of how IKS can be incorporated into the curriculum, teaching, and learning processes. Moreover, the fact that the framework is typically results-oriented also allows one to engage in evidence-based evaluation, which will help the institutions and the policymaking community to decide whether the approach is effective. This framework thus shifts the borders of the current literature by viewing IKS as a living system which integrates tradition and innovation.d framework of operationalizing Indian Knowledge systems in education and technology. The proposed research is exploratory, and the literature does not have empirically validated models, which is why a systematic literature analysis approach is suitable. A literature review of the academic literature was conducted to examine the academic literature on the Indian Knowledge Systems, indigenous knowledge frameworks, education reform, emerging technologies, governance models and assessment practices. The inclusion criteria used in the selection of peer-reviewed articles, edited volumes, policy documents, and authoritative reports were related to the relevance to the integration of Indian Knowledge Systems, technological mediation, and outcome-based assessment. The selected literature bases its coverage of the areas in education, heritage studies, technology governance and sustainability to offer an interdisciplinary perspective. The thematic synthesis was applied to analyze the literature that identified the patterns, limitations, and conceptual relations. Philosophical workings of IKS, problems with the process, the application of digital technology, how it is assessed and measured, stakeholder involvement and scalability were some of the significant themes that were identified. These themes were used in identifying a single research gap and they also aided in the development of the proposed conceptual framework. Development of the conceptual framework was made by an iterative analytical approach in which the results of the thematic analysis were compared in terms of the research gaps detected in the literature body. Every component of the intended conceptual framework was made to overcome certain gaps in the literature in terms of operationalisation, integration of technology, and quantifiable nature. The study is a conceptual study and does not entail the use of primary empirical data or experimental validation. However, the suggested conceptual framework is formulated in a manner that it can be empirically tested in further studies as a case study, pilot study, survey and mixed-method study in the educational and technological sphere.

VII. CONCLUSION

This study was meant to investigate the shortcomings of the current literature on Indian Knowledge Systems and fill the gap between the philosophical and application sides of the discussion. Through a systematic review and thematic synthesis of the available literature, the study has investigated the key issues related to the empirical validation, operational frameworks, technology-driven implementation, stakeholder involvement, and scalability. In this respect, this paper presented a comprehensive conceptual framework that converts the philosophical foundations of Indian Knowledge Systems into practical activities that are facilitated by modern technologies and indicators of impacts. Combining philosophical foundations and operational strategies and result-based evaluations, this conceptual framework offers a structural method of introducing IKS into the current systems of education and technological advances. This study is relevant to the emerging literature on IKS because it shifts the argumentation on the topic to the realms of operationalization and evidence-based practice. In this regard, this study brings to focus the possibility of the Indian Knowledge Systems to facilitate the ethical, inclusive, and sustainable innovations within the fast-evolving digital landscape.

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VIII. FUTURE WORK

Even though this paper provides a conceptual framework, more studies are required to support empirically and develop this proposed framework. The effectiveness of the framework can be proven in future research and case-based or pilot implementation in educational settings, in technology-enabled learning environment, or in an ecosystem of innovations. Quantitative performance indicators coupled with qualitative inputs of stakeholders would provide more information on learning results, interest, and preparedness of the institutions. The different case-studies in the various subject areas, institutions, and geographical regions would enhance the external validity of the findings and contribute to the scaling up process. More advanced technologies, such as artificial intelligence, learning analytics, and adaptive assessment systems, can also be integrated in the research to develop IKS practices further. Long-term studies of the long-term outcomes would also be desirable to be aware of the long-term impacts of IKS integration in the fields of education, innovation, and policy-making.

IX. REFERNCES

[1] Ahmadi, M., & HaghighatBin, M. (2026). Integrating tangible and intangible cultural values into rural landscape planning: A value-based framework for sustainable development in Iran. *Built Heritage, 10*, Article 3. https://doi.org/10.1186/s43238-025-00242-8

[2] Aithal, S., Mishra, A. K., Mishra, S., & Celestin, M. (2026). *Ancient Indian knowledge systems as catalysts for technological innovation: Bridging tradition with digital transformation*. ResearchGate. https://www.researchgate.net/publication/400040562

[3] Ali, M. M. (2026). Investing in heritage: A financial viability framework for eco-innovation in Cumilla's Khadi textile sector in Bangladesh. *International Journal of Accounting and Economics Studies, 13*(1), 120–132. https://doi.org/10.14419/fhb8tq10

[4] Chandratreya, A., Sharma, R., Iyer, S., & Mukherjee, A. (2024). Bridging ancient wisdom and modern academia: Indian knowledge systems in higher learning. In M. Chandra, G. Tiwari, A. Mukherjee, & A. Dubey (Eds.), *Transforming higher education through Indian knowledge systems* (Vol. 1, pp. 6–19). A2Z EduLearningHub LLP.

[5] Choto, H. M., & Remadan, N. M. (2026). A transformative practice-based pedagogical model for architectural design education: Bridging practice, teaching, and research. *Journal of Engineering and Applied Science, 73*, Article 28. https://doi.org/10.1186/s44147-026-00892-0

[6] Danielsen, F. (2025). Bridging knowledge systems to guide natural resource governance under global change. *Trends in Ecology & Evolution*. Advance online publication. https://doi.org/10.1016/S0169-5347(25)00369-6

[7] Lee, B. N., & Shin, C. (2026). Bridging past and future: A historical narrative of the Old Jambatan Tamparuli and prospects of AI integration. *Social Sciences Research*. https://doi.org/10.5281/zenodo.18351191

[8] Meera, S., & Vinodan, A. (2025). Festivals as adaptive governance systems: Deriving a nano-scale framework for sustainability and crisis management from Thrissur Pooram, India. *International Journal of Event & Festival Management, 17*(1), 161–182. https://doi.org/10.1108/IJEFM-02-2025-0026

[9] Pillai, A. (2026). Reimagining learning: NEP 2020 and the role of assessment in incorporating ancient Indian knowledge systems. *Creative Saplings, 2*. https://creativesaplings.in/index.php/1/article/view/1108

[10] Pisal, S. R. (2025). Education and knowledge systems: Indian Knowledge System (IKS). *Royal International Global Journal of Advance and Applied Research, 2*(9), 133–136. https://doi.org/10.5281/zenodo.17615261

[11] Ray, S., & Ray, R. L. (2026). Incorporating indigenous knowledge systems into AI governance: Enhancing ethical frameworks with Māori and Navajo perspectives. *AI and Ethics, 6*, Article 114. https://doi.org/10.1007/s43681-025-00970-8

[12] Srivastava, S. P. (2026). Integrating Indian languages and knowledge systems to decolonize legal education in India. *International Journal of Judicial Law, 5*(1), 17–25. https://doi.org/10.54660/IJJL.2026.5.1.17-25