

FROM TEACHING PROVIDERS TO KNOWLEDGE ENGINES: TRANSFORMING PRIVATE HIGHER EDUCATION IN ACEH AMID THE ARTIFICIAL INTELLIGENCE REVOLUTION

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ABSTRACT

The rapid advancement of Artificial Intelligence (AI) is fundamentally reshaping the global landscape of higher education, challenging established business models and modes of knowledge delivery. In Indonesia, Private Higher Education Institutions (PHEIs) serve a critical role in expanding access, yet they remain structurally vulnerable due to heavy reliance on tuition fees and a prevailing focus on instruction over inquiry. This article examines the existential challenges facing PHEIs, with specific focus on the post-conflict, resource-rich but economically constrained context of Aceh. It argues that the traditional model of “teaching factories” is no longer viable in an era where AI democratizes information access. Instead, PHEIs must undergo a paradigm shift to become Knowledge Engines: institutions that treat research, faculty development, and community engagement as strategic investments rather than operational costs. Drawing on recent global literature and local contextual analysis, the study proposes a four-pillar framework comprising problem-centred local research, faculty empowerment as knowledge producers, integrated curricula, and strategic partnership development. The analysis demonstrates that by leveraging AI not merely for efficiency but to unlock local data and contextual insights, PHEIs can build unique competitive advantages that large public universities cannot easily replicate. This transformation is not only essential for institutional survival but also vital for ensuring that higher education contributes meaningfully to regional development, cultural preservation, and intellectual independence in Aceh and across Indonesia.

Keywords: *Private Higher Education; Artificial Intelligence; Institutional Transformation; Knowledge Economy; Aceh; Educational Sustainability.*

1. INTRODUCTION

Artificial intelligence (AI) has emerged as one of the most transformative technologies of the twenty-first century, fundamentally reshaping the ways organizations create value, generate knowledge, and respond to increasingly complex societal challenges. The rapid evolution of generative artificial intelligence, large language models, machine learning, and intelligent automation has accelerated digital transformation across nearly every sector, including higher education. Unlike previous waves of digital innovation that primarily enhanced administrative efficiency or facilitated online learning, contemporary AI technologies are redefining the core missions of universities by influencing teaching, research,

governance, innovation, and societal engagement. Consequently, higher education institutions are no longer expected merely to disseminate existing knowledge through teaching but increasingly to function as adaptive, knowledge-intensive organizations capable of continuously producing, integrating, and transferring knowledge to address regional and global challenges (Dwivedi et al., 2023; UNESCO, 2023).

The emergence of generative AI has intensified this transformation. AI-powered tools are increasingly embedded within academic activities, supporting literature discovery, research synthesis, scientific writing, curriculum development, learning analytics, academic advising, institutional planning, and administrative decision-making. These developments demonstrate that AI is not simply another educational technology but a general-purpose technology capable of reshaping institutional structures and organizational processes. Dwivedi et al. (2023) argue that generative conversational AI represents a technological inflection point that offers unprecedented opportunities while simultaneously introducing significant ethical, governance, and organizational challenges. Universities are therefore required to rethink not only how teaching is delivered but also how institutional knowledge is created, managed, and translated into innovation and societal impact.

This shift coincides with a broader redefinition of the role of higher education. Historically, universities were viewed primarily as institutions responsible for educating skilled workers and preserving established knowledge. However, the rise of the knowledge economy has raised new expectations: universities are now recognized as strategic actors within national and regional innovation systems. They are expected to drive scientific discovery, stimulate entrepreneurship, facilitate technology transfer, and contribute directly to economic competitiveness. This expanded function has given rise to the concept of universities as knowledge engines, emphasizing their ability to generate, integrate, and share knowledge through collaborative networks involving government, industry, and communities (Etzkowitz & Zhou, 2017). Under this framework, success is measured not only by teaching quality but also by research output, innovation capacity, and contribution to social and economic development.

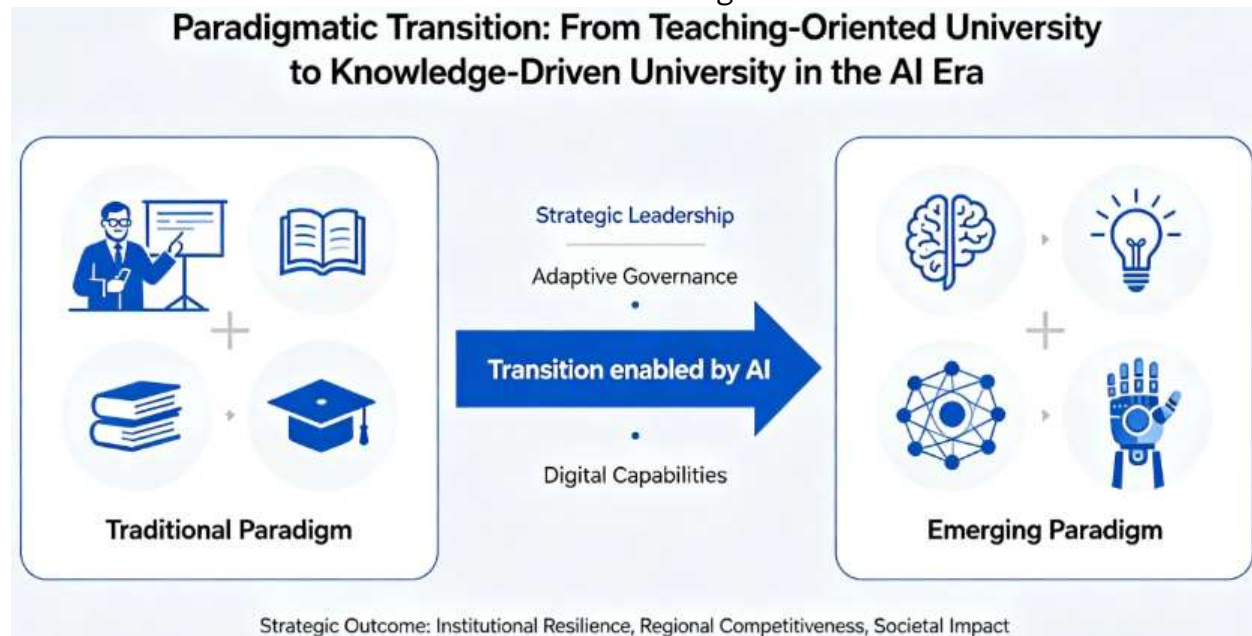
AI serves as a critical catalyst in this transition. Through advanced data analytics, intelligent research support systems, and automated knowledge management, it helps institutions improve research productivity, strengthen interdisciplinary collaboration, optimize governance, and support strategic decision-making. Katsamakos et al. (2024) suggest that AI should be understood as a driver of systemic institutional change rather than just a set of tools. Effective implementation requires parallel adjustments in leadership, governance, culture, infrastructure, and human competencies. Only then can universities evolve into resilient knowledge ecosystems that deliver long-term value.

Nevertheless, existing research reveals a clear gap. Early studies focused mainly on AI applications in learning and student support, with limited attention to organizational and

governance aspects (Zawacki-Richter et al., 2019). Even as recent research expands to cover teaching and curriculum design, most studies still prioritize operational implementation over long-term institutional transformation (Bond et al., 2024; Batista et al., 2024). From a theoretical perspective, Dynamic Capabilities Theory explains that sustainable adaptation depends on an institution’s ability to sense change, seize opportunities, and reconfigure resources (Teece, 2018). This confirms that technology alone cannot deliver transformation; it must be supported by strong leadership, adaptive policies, and ethical frameworks that ensure transparency and academic integrity (UNESCO, 2023).

Collectively, these observations highlight that higher education is undergoing a paradigm shift. While AI accelerates this process, its true potential depends on comprehensive organizational change. This study therefore aims to examine how private higher education institutions—particularly in developing regions such as Aceh—can strategically leverage AI to move beyond their traditional role as teaching providers and evolve into dynamic knowledge engines capable of contributing to sustainable regional development.

Figure 1. A Paradigm Shift in Higher Education: The Transition to Science-Oriented Universities in the Age of AI



Source: Based on author analysis, 2026

Figure 1. Paradigmatic transition from a teaching-oriented university to a knowledge-driven institution enabled by artificial intelligence. This shift is driven by technological advancement and supported by strategic leadership, adaptive governance, human capacity, and ethical frameworks. The outcome is enhanced institutional resilience, innovation, and sustainable contribution to the knowledge economy and regional development.

Source: Adapted from Teece (2018), Etzkowitz & Zhou (2017), and UNESCO (2023).

2. Research Method

Research Design

This study adopted a qualitative multiple-case study design to investigate how private higher education institutions (PHEIs) in Aceh are transforming from teaching-oriented institutions into knowledge engines amid the rapid advancement of artificial intelligence (AI). A qualitative approach was considered appropriate because the study aims to explore organizational transformation as a complex social phenomenon involving leadership, governance, institutional capabilities, organizational learning, and strategic adaptation. Qualitative inquiry enables researchers to examine participants' experiences, perceptions, and institutional practices within their natural settings while capturing the contextual factors shaping organizational change (Creswell & Poth, 2018).

A multiple-case study design was employed because institutional transformation is influenced by organizational context, leadership commitment, digital maturity, and resource availability. Studying multiple institutions allows the identification of common transformation patterns while simultaneously recognizing contextual differences across cases. Compared with a single-case design, multiple-case studies enhance analytical robustness through cross-case comparison and strengthen the transferability of findings (Yin, 2018; Harrison et al., 2017).

Research Context

The research was conducted in private higher education institutions located in Aceh Province, Indonesia. Private universities constitute an essential component of the regional higher education system by expanding educational access and supporting local socioeconomic development. However, these institutions also face increasing demands to improve research productivity, digital governance, innovation capability, and institutional competitiveness within the emerging AI-driven knowledge economy. Consequently, Aceh provides an appropriate empirical context for examining how resource-constrained universities strategically respond to technological disruption while pursuing long-term institutional transformation.

Participant Selection

Participants were selected using purposive sampling, a technique that enables researchers to identify individuals possessing rich knowledge and direct experience relevant to the research objectives (Merriam & Tisdell, 2016). The study targeted participants occupying strategic positions within their institutions, including rectors, vice rectors, deans, directors of quality assurance, heads of research institutes, information technology managers, and senior academic staff responsible for institutional planning or digital transformation initiatives.

Participants were selected based on three inclusion criteria: (1) active involvement in institutional governance or strategic decision-making; (2) direct experience with AI adoption, digital transformation, or innovation management; and (3) willingness to participate voluntarily in the research. Data collection continued until theoretical saturation was achieved, whereby additional interviews generated no substantially new themes or insights (Creswell & Poth, 2018).

Data Collection

Data were collected using three complementary techniques: semi-structured interviews, document analysis, and non-participant observations. Employing multiple sources of evidence enhances the credibility of qualitative case studies by allowing researchers to triangulate findings across different forms of data (Yin, 2018).

Semi-structured interviews served as the primary data collection method because they provide sufficient flexibility to explore participants' experiences while maintaining consistency across interviews (Creswell & Poth, 2018). An interview protocol was developed based on the conceptual framework and focused on five themes: institutional AI strategy, digital transformation initiatives, organizational capabilities, governance mechanisms, and institutional transformation toward becoming knowledge engines. Interviews were conducted either face-to-face or online, lasted approximately 60–90 minutes, and were audio-recorded with participants' informed consent before being transcribed verbatim.

Document analysis was undertaken to complement interview findings and strengthen contextual understanding. Institutional strategic plans, digital transformation roadmaps, annual reports, accreditation documents, research performance reports, quality assurance manuals, and institutional policies were reviewed to identify evidence of organizational change and AI-related initiatives (Merriam & Tisdell, 2016).

Where feasible, non-participant observations were also conducted to understand the practical implementation of AI-supported academic and administrative processes. Observation focused on institutional digital infrastructure, learning management systems, research management platforms, and AI-enabled administrative services. These observational data provided additional contextual information that supported the interpretation of interview and documentary evidence.

Data Analysis

The collected data were analyzed using reflexive thematic analysis, following the methodological framework developed by Braun and Clarke (2022). This analytical approach was selected because it provides a systematic yet flexible procedure for identifying, organizing, and interpreting patterns of meaning across qualitative datasets.

The analysis consisted of six iterative stages. First, all interview transcripts, observation notes, and institutional documents were read repeatedly to achieve familiarity with the data. Second, meaningful segments of text were coded systematically to identify ideas related to

AI implementation, organizational capabilities, leadership, governance, and institutional transformation. Third, similar codes were grouped into preliminary themes representing broader organizational processes. Fourth, candidate themes were reviewed by comparing coded extracts with the complete dataset to ensure internal consistency and conceptual coherence. Fifth, themes were refined, clearly defined, and interpreted in relation to the theoretical perspectives underpinning the study. Finally, the themes were synthesized into an integrated explanation of AI-enabled institutional transformation across participating universities (Braun & Clarke, 2022).

To improve analytical rigor, cross-case analysis was subsequently conducted by comparing themes across institutions. This procedure enabled the identification of recurring patterns, contextual variations, enabling factors, institutional barriers, and distinctive transformation pathways among participating universities (Yin, 2018; Harrison et al., 2017).

Throughout the analytical process, the principles of high-quality reflexive thematic analysis were applied by maintaining transparency in coding decisions, ensuring conceptual coherence among themes, and continuously reflecting on the researchers' interpretive role during data analysis (Braun & Clarke, 2021).

Trustworthiness

To ensure methodological rigor, this study adopted the trustworthiness framework proposed by Lincoln and Guba (1985), encompassing credibility, transferability, dependability, and confirmability.

Credibility was strengthened through methodological triangulation by integrating interviews, document analysis, and observations. Member checking was also conducted by inviting selected participants to review interview summaries and preliminary interpretations to ensure the accuracy of the findings. Transferability was enhanced through detailed descriptions of the research context, institutional characteristics, participant profiles, and research procedures, allowing readers to assess the applicability of findings to comparable settings.

Dependability was achieved by maintaining a comprehensive audit trail documenting interview protocols, coding procedures, analytical decisions, and theme development. Confirmability was supported through reflective memo writing, systematic documentation of analytical processes, and preservation of original empirical data, ensuring that interpretations were grounded in participants' accounts rather than researchers' personal assumptions (Lincoln & Guba, 1985).

Ethical Considerations

Ethical principles guided all stages of the research. Participants were informed about the objectives of the study, the voluntary nature of participation, confidentiality procedures, and their right to withdraw at any time without adverse consequences. Written informed consent was obtained before data collection commenced. To protect confidentiality, all

personal identifiers and institutional names were anonymized during transcription, analysis, and reporting. Interview recordings, transcripts, field notes, and institutional documents were securely stored and accessed only by the research team for academic purposes.

By integrating multiple sources of evidence, rigorous thematic analysis, and established trustworthiness procedures, this methodological approach provides a robust foundation for understanding how private higher education institutions in Aceh strategically leverage artificial intelligence to strengthen organizational capabilities and transform into knowledge engines within the emerging digital knowledge economy.

4. Results and Discussion

4.1 Institutional Readiness for AI-Driven Transformation

The thematic analysis identified institutional readiness as the first major theme explaining how private higher education institutions in Aceh respond to the rapid emergence of artificial intelligence. Across the participating institutions, participants consistently emphasized that AI adoption is increasingly perceived as a strategic priority rather than merely an educational technology. Several respondents indicated that institutional readiness was reflected through leadership commitment, strategic planning, digital infrastructure, and faculty digital competencies.

Quotation dari Pimpinan PTS:

"Sekarang AI itu sudah tidak bisa dihindari lagi. Kalau kampus masih fokus mengajar saja, lama-lama akan tertinggal. Kami ingin AI dimanfaatkan bukan hanya di kelas, tapi juga untuk penelitian, pelayanan akademik, sampai pengambilan keputusan di tingkat pimpinan."

Similarly,

"Yang paling berat sebenarnya bukan membeli aplikasinya. Yang sulit itu mengubah cara berpikir dosen dan tenaga kependidikan supaya mau belajar teknologi baru dan menggunakannya dengan benar." (P2)

P3 – Dekan

"Sekarang hampir semua dosen sudah mencoba memakai ChatGPT atau AI lainnya. Ada yang memakainya untuk mencari referensi, menyusun RPS, sampai membantu menulis proposal penelitian. Tapi kemampuan setiap dosen memang masih berbeda-beda." (P3)

P4 – Ketua LPPM

"Kalau menurut saya, AI sangat membantu penelitian. Mencari literatur jadi lebih cepat, menyusun proposal juga lebih mudah. Tetapi tetap harus dicek lagi karena tidak semua informasi dari AI itu benar." (P4)

P5 – Dosen

"AI itu menurut saya bukan pengganti dosen. Justru dosen harus bisa mengarahkan mahasiswa supaya tahu mana informasi yang bisa dipakai dan mana yang harus dikritisi." (P5)

S1 – Mahasiswa

"Saya hampir setiap hari pakai AI buat cari ide, cari jurnal, atau memahami materi yang susah. Tapi tetap saya diskusikan lagi sama dosen karena kadang jawaban AI juga tidak sesuai dengan konteks." (S1)

S2 – Mahasiswa Pascasarjana

"AI membuat pekerjaan lebih cepat, terutama waktu menyusun proposal tesis. Yang penting kami tetap paham isi yang ditulis dan tidak langsung menyalin hasil dari AI." (S2)

These findings suggest that the success of AI-driven institutional transformation depends not only on the availability of technological infrastructure but also on the readiness of human resources, organizational learning, and the development of an adaptive institutional culture. This interpretation is consistent with Vial (2019), who argues that digital transformation represents a comprehensive organizational change process rather than the adoption of digital technologies alone. Similarly, Verhoef et al. (2021) emphasize that sustainable digital transformation requires strategic alignment among leadership, governance, organizational capabilities, and value creation. Within the higher education context, the findings also support Bond et al. (2024), who contend that effective AI implementation requires institutional readiness, ethical governance, interdisciplinary collaboration, and continuous capacity building to ensure that AI contributes meaningfully to teaching, research, and institutional development.

The analysis of the **University Research Master Plan (RIP) 2024–2028** indicates that digital transformation and artificial intelligence have been incorporated into the institutional research agenda. The document encourages interdisciplinary research, digital innovation, and collaborative partnerships to improve research productivity and societal impact. However, interview participants noted that the translation of these strategic priorities into operational practices differed considerably across faculties, primarily due to variations in research capacity, digital infrastructure, and faculty readiness to adopt AI technologies.

Table 1. Cross-case Institutional Readiness

Theme	University A	University B	University C
Leadership commitment	High	Moderate	Moderate
AI governance	Emerging	Limited	Limited
Digital infrastructure	High	Moderate	Low
Faculty readiness	Moderate	Moderate	Low

Source: Author Analysis, 2026

The findings suggest that institutional readiness depends not only on technological availability but also on strategic alignment between leadership, governance, and organizational capabilities.

This finding supports Vial (2019), who argues that digital transformation should be understood as organizational transformation rather than technological implementation alone. Likewise, Verhoef et al. (2021) emphasize that successful digital transformation requires coordinated changes in organizational strategy, governance structures, business processes, and institutional value creation. The variation observed across the participating universities also reflects the capability differences highlighted by Hanelt et al. (2021), who identify organizational flexibility and leadership commitment as key determinants of successful digital transformation.

4.2 AI as a Catalyst for Institutional Transformation

The second theme reveals that artificial intelligence (AI) has gradually expanded beyond classroom applications to become a strategic enabler of institutional transformation. Participants consistently described AI as supporting a wide range of academic and administrative activities, including curriculum development, research proposal preparation, scientific writing, institutional reporting, quality assurance, academic administration, and research management. These findings indicate that AI is no longer perceived merely as an instructional technology but increasingly as an organizational resource capable of enhancing institutional performance and supporting evidence-based decision-making.

A similar perspective emerged from the interview with the Director of Research, who highlighted AI's contribution to strengthening the university's research ecosystem:

"Artificial intelligence has significantly accelerated several stages of the research process. It helps lecturers identify research gaps, organize scientific literature, and prepare research proposals more efficiently. However, AI should be viewed as a supporting tool, while critical thinking, methodological rigor, and research ethics must remain the responsibility of researchers." (P4)

From the students' perspective, AI was also perceived as improving learning effectiveness and academic productivity. Students acknowledged that AI facilitated access to learning resources, enhanced understanding of complex concepts, and supported academic writing. Nevertheless, they emphasized that lecturer supervision remained essential to ensure the accuracy, relevance, and ethical use of AI-generated information.

As one student explained:

"AI really helps me understand difficult topics and organize ideas for assignments. But I still discuss the results with my lecturer because AI can sometimes provide inaccurate or overly general information. Guidance from lecturers is still essential." (S2)

The convergence of perspectives from institutional leaders and students indicates that AI increasingly functions as an institutional capability that strengthens organizational learning rather than simply automating academic tasks. Instead of replacing lecturers or researchers, AI supports knowledge creation by improving information accessibility, accelerating academic processes, and facilitating collaboration across teaching, research, and administration.

Consequently, AI contributes to the development of a more adaptive and knowledge-oriented institutional environment.

These findings are consistent with the systematic review conducted by Castro Benavides et al. (2020), which demonstrates that digital transformation in higher education extends beyond instructional technologies to encompass institutional governance, research systems, academic administration, organizational management, and stakeholder engagement. Likewise, Katsamakos et al. (2024) conceptualize AI as a system-wide driver of institutional transformation capable of reshaping organizational structures, strategic capabilities, and decision-making processes. Rather than functioning as an isolated technological innovation, AI becomes embedded within the broader institutional ecosystem and influences multiple organizational dimensions simultaneously.

From a pedagogical perspective, the present findings also support Crompton and Burke (2023), who argue that AI has evolved from classroom support tools into institution-wide digital ecosystems integrating teaching, research, administration, and quality assurance. Furthermore, Bond et al. (2024) emphasize that realizing the transformative potential of AI requires ethical governance, interdisciplinary collaboration, institutional readiness, and continuous capacity building. This suggests that universities should approach AI not merely as a technological innovation but as a strategic organizational capability that enables continuous learning, institutional innovation, and sustainable transformation.

4.3 Integrated Discussion

Taken together, the findings indicate that AI should be viewed as an institutional transformation strategy rather than merely an educational technology. While technological infrastructure remains important, sustainable transformation depends primarily upon leadership commitment, organizational learning, governance mechanisms, and dynamic organizational capabilities.

Accordingly, this study proposes that private higher education institutions can evolve from teaching providers into knowledge engines when AI adoption is integrated with institutional strategy, research development, innovation ecosystems, and stakeholder collaboration. This proposition contributes to the digital transformation literature by extending the organizational perspective of Vial (2019) and Verhoef et al. (2021) into the context of AI-enabled higher education. Simultaneously, it complements the higher education literature by integrating the AI ecosystem perspective of Bond et al. (2024) and Katsamakos et al. (2024) with the dynamic capability framework of Warner and Wäger (2019) and Hanelt et al. (2021). Collectively, these findings suggest that universities in emerging regions can strengthen their competitiveness not only by adopting AI technologies but also by cultivating the organizational capabilities necessary to transform knowledge into innovation and regional development.

5. Conclusion

This study demonstrates that the transformation of private higher education institutions from traditional teaching providers into knowledge engines requires more than the adoption of artificial intelligence (AI) technologies. Rather, AI serves as a strategic catalyst that enables broader institutional transformation when supported by strong leadership, effective governance, organizational learning, digital competencies, and an innovation-oriented culture. The proposed conceptual framework suggests that AI creates value not through technological deployment alone but through the development of dynamic organizational capabilities that enhance universities' capacity for knowledge creation, research excellence, and regional engagement.

The study further contributes to the growing literature on AI in higher education by integrating perspectives from digital transformation and dynamic capability theory within the context of private universities in emerging regions. While previous studies have primarily examined AI from pedagogical or technological perspectives, this study positions AI as an institutional capability that reshapes governance, research management, academic administration, and strategic decision-making. In doing so, it advances the concept of the Knowledge Engine University, where teaching, research, innovation, and community engagement operate as interconnected functions supported by AI-enabled organizational capabilities.

From a practical perspective, the findings highlight the importance of developing comprehensive institutional strategies that integrate AI into long-term governance, human capital development, digital infrastructure, and research ecosystems. Policymakers and university leaders should therefore prioritize investments not only in AI technologies but also in organizational capabilities that foster continuous learning, interdisciplinary collaboration, ethical AI governance, and evidence-based decision-making.

This study is subject to several limitations, including its focus on private higher education institutions within a specific regional context and the qualitative nature of the research. Future studies could employ comparative cross-country designs, mixed-method approaches, or longitudinal analyses to examine how AI-driven organizational transformation evolves across different higher education systems. Such research would further strengthen understanding of how universities can effectively transition from teaching providers to sustainable knowledge engines in the era of artificial intelligence.

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